DAVID W. NAGORSEN

An IDENTIFICATION MANUAL *to the* SMALL MAMMALS OF BRITISH COLUMBIA

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DAVID W. NAGORSEN

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Ministry of Sustainable Resource Management,
Ministry of Water, Land and Air Protection, Biodiversity Branch,
and Royal British Columbia Museum

March 2002

Abstract

This manual covers the 83 native and introduced marsupial, insectivore, bat, lagomorph, and rodent species known to occur in British Columbia. It is intended to serve as a standard reference for students and wildlife biologist identifying voucher specimens or animals "in the hand" captured during field studies. The manual has two independent sets of identification keys, one for whole animals or museum study skins and the other for cleaned skulls. In addition, a brief species account is provided for each of the 83 species. Each account includes a description, body measurements and weight, information on discriminating similar species, a range map, and illustrations of the species and its skull. Technical terms are defined in a glossary; important references and other useful identification manuals are listed in a bibliography.

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Introduction

As part of the province's mandate to conserve biodiversity and endangered species, inventory and field research on the small mammals of British Columbia has increased substantially over the past few decades. Reliable identification obviously is essential in these studies. Yet many small mammal species are difficult to identify particularly in the field. Despite the importance of accurate identification, at present no single publication exists that could serve as a standard for identification. Identification keys developed specifically for the province's mammals are found in The Mammals of British Columbia (Cowan and Guiguet 1965), but this handbook is now out-of-print and dated. Four small mammals, Spotted Bat (*Euderma maculatum*), Merriam's Shrew (*Sorex merriami*), Preble's Shrew (*Sorex preblei*), and the Tundra Shrew (*Sorex tundrensis*) have been added to the provincial fauna since The Mammals of British Columbia was last revised in 1965. Furthermore, the keys in Cowan and Guiguet (1965) do not reflect recent taxonomic changes such as the treatment of the Dusky Shrew (*Sorex monticolus*) and Vagrant Shrew (*Sorex vagrans*), Keen's Mouse (*Peromyscus keeni*) and Deer Mouse (*Peromyscus maniculatus*), and Keen's Long-eared Myotis (*Myotis keenii*) and the Northern Long-eared Myotis (*Myotis septentrionalis*) as distinct species. New updated identification keys are provided in the revised Royal British Columbia Museum handbook series on the mammals of British Columbia (Nagorsen and Brigham 1993, Nagorsen 1996) and a key to the rodent and lagomorph species will be in included volume 4 (now in preparation). However, with the discovery of Merriam's Shrew and Preble's Shrew in the Okanagan Valley in 1999 (Nagorsen et al. 2001) and unresolved identification problems associated with the long-eared myotis bats, the keys in Nagorsen and Brigham (1993) and Nagorsen (1996) require fine-tuning.

The objective of this publication is to provide an up-to-date identification manual in the form of a single book that can be easily carried in the field by wildlife biologists, foresters, conservation officers, naturalists, and students. It will also be a useful reference for university or community college courses that require identification of the province's mammalian fauna. The manual is restricted to the 83 native and introduced marsupial, insectivore, bat, lagomorph, and rodent species known to occur in British Columbia (see the Checklist for their common and scientific names). These orders include the small terrestrial mammals most often studied in provincial inventories and the species with the most identification problems. Small carnivores such as weasels, are excluded, although they could be considered "small mammals" by some definitions. A Royal British Columbia Museum handbook on the "Carnivores of British Columbia" is now in preparation and it will contain detailed identification keys to the province's carnivores.

This manual is designed to identify animals "in the hand" or voucher specimens; it is not intended as a field guide for identifying sightings or mammalian sign such as tracks. Two independent sets of identification keys are provided, one for whole animals and the other for cleaned skulls. In addition to the identification keys, there is a brief species account for each species with a synoptic summary of the species' description, identification from similar species, and a provincial range map. The accounts are intended to provide additional information that will assist with identification. A glossary of technical terms used in the keys has been included; important references on the mammalian fauna of British Columbia and other identification manuals that may be useful to the reader are summarized in the Bibliography.

Before you begin a study, prepare a list of potential species for your study area. For distributional information, consult the species accounts in this manual and the Royal British Columbia Handbooks (Cowan and Guiguet 1965; Nagorsen and Brigham 1993; Nagorsen 1996). Researchers are urged to contact the Ministries of Sustainable Resource Management and Water, Land and Air Protection, or the Royal British Columbia Museum. These organizations can provide more specific information on the small mammals in your study area, species of special interest, potential identification problems, and guidelines for collecting voucher specimens. Careful consideration should be given to voucher specimens and sampling techniques before you initiate a study. Vouchers are essential to verify the identifications of some species. Dead animals taken in kill traps or animals that die accidentally in live capture studies should be kept for reference and future research. For species difficult to identify, the researcher should consider taking a representative sample of specimens as vouchers even in live capture studies. For details on vouchers specimens see Voucher Specimen Collection, Preparation, Identification, and Storage Protocol: Animals (Ministry of Environment, Lands and Parks, Resources Inventory Branch 1999). Nonetheless, some small mammals covered in this manual are considered potentially threatened or endangered; sampling techniques that involve killing should be avoided for these species. Users should be aware that the small mammals of British Columbia are protected from direct harm under the provincial *Wildlife Act*, and taking voucher specimens or even live capture of these animals require permits that can be obtained from the regional offices of the Ministry of Water, Land and Air Protection.

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This publication was a co-operative project with the former Wildlife Branch, British Columbia Ministry of Environment, Lands and Parks and the Royal British Columbia Museum, initiated in 1992. I especially thank Laura Friis for her continued support and encouragement. The many illustrations were done by Bill Adams, Donald Gunn, and Michael Hames whose patience and helpful suggestions were much appreciated. I am indebted to Arifin Graham of Alaris Design for his production of the manuscript for desk-top publishing and his unflagging support despite the many setbacks and delays associated with the project. Nick Panter tested the keys and provided invaluable feedback; Gail Harcombe coordinated final production of the manual. I thank Dave Hatler for his unpublished weights and linear measurements of muskrats and beaver and Tod Zimmerling for porcupine weights from his Ph.D. dissertation.

The development of the identification keys, species descriptions, and measurements were based largely on museum specimens. Most of my research was based on the collections of the Royal British Columbia Museum (Victoria) supplemented with the mammal collections of the American Museum of Natural History (New York), Burke Museum (University of Washington, Seattle), California Academy of Sciences (San Francisco), Cowan Vertebrate Museum (University of British Columbia, Vancouver), Canadian Museum of Nature (Ottawa), Museum of Vertebrate Zoology (University of California, Berkeley), Royal Ontario Museum (Toronto), Slater Museum (University of Puget Sound, Tacoma), and the United States National Museum (Washington, DC). I thank those institutions for allowing me to examine and measure British Columbian specimens in their collections.

Funding for production of this manual was provided by the BC Ministry of Water, Land and Air Protection, the Royal British Columbia Museum, and Forest Renewal BC.

How to use this manual

A key to mammalian orders is the first key in the manual. Once you have determined the mammalian order, select the appropriate key for identifying your animal. The key to whole animals is intended for use on restrained or anaesthesized live animals, dead animals, or museum study skins. The key to skulls is based on cranial or dental traits, and it is intended for use on voucher specimens prepared as museum specimens, or skulls recovered in raptor pellets. Unfortunately, the four chipmunk species found in the province cannot be reliably identified from pelage or skull traits, and in some regions they can only be discriminated from their genital bone morphology. Therefore, a separate key to chipmunk genital bones in the manual is provided. This key can only be applied to genital bone specimens that have been specially prepared by clearing and staining.

All of the keys are dichotomous, with diagnostic characters arranged into couplets; each couplet offers two mutually exclusive choices labelled a or b. Begin with couplet number one and select either a or b. This will give you a species name or direct you to another couplet in the key. By systematically working through the various steps, the user will eventually arrive at an identification. Consult the species account to verify that your identification is consistent with the species' description and range map.

An introductory section at the beginning of each key summarizes the important diagnostic traits and pitfalls in identifying species of that group. The author tried to avoid subjective characteristics (e.g., slightly smaller than or slightly darker than) and instead emphasized presence or absence traits, absolute size differences, and absolute colour or pelage pattern differences. Although some of these mammals have restricted distributions in the province, the author deliberately avoided geography in the keys (e.g., found only in the Okanagan Valley). Accurate locality information may be lacking for some individuals. Moreover, the precise range for many small mammals in the province is unknown and excluding a species on the assumption that it is absent from an area could be misleading. Similarly, designing separate keys for different geographic regions of the province was not practical for a single manual designed to cover the entire province.

Checklist of species

This is a list of the scientific and common names for the 83 mammalian species (75 native and 8 introduced) covered in the manual. Common and scientific names are based on The Vertebrates of British Columbia: Scientific and English Names (Ministry of Environment, Lands and Parks, Resources Inventory Branch 2000). Orders and families are arranged according to their generally accepted phylogenetic sequence. The subfamilies of the rodent family Muridae are ordered alphabetically. Genera within a family and species within a genus are ordered alphabetically.

(I)= introduced species.

ORDER DIDELPHIMORPHIA: NEW WORLD OPOSSUMS

FAMILY DIDELPHIDAE: NEW WORLD OPOSSUMS

Didelphis virginiana Kerr	North American Opossum (I)

ORDER INSECTIVORA: INSECTIVORES

FAMILY SORICIDAE: SHREWS

Sorex arcticus Kerr	Black-backed Shrew
Sorex bendirii (Merriam)	Pacific Water Shrew
Sorex cinereus Kerr	Common Shrew
Sorex hoyi Baird	Pygmy Shrew
Sorex merriami Dobson	Merriam's Shrew
Sorex monticolus Merriam	Dusky Shrew
Sorex palustris Richardson	Common Water Shrew
Sorex preblei Jackson	Preble's Shrew
Sorex trowbridgii Baird	Trowbridge's Shrew
Sorex tundrensis Merriam	Tundra Shrew
Sorex vagrans Baird	Vagrant Shrew

FAMILY TALPIDAE: MOLES

Neurotrichus gibbsii (Baird)	Shrew-mole
Scapanus orarius True	Coast Mole
Scapanus townsendii (Bachman)	Townsend's Mole

ORDER CHIROPTERA: BATS

FAMILY VESPERTILIONIDAE: VESPERTILIONID BATS

Antrozous pallidus (Le Conte)	Pallid Bat
Corynorhinus townsendii (Cooper)	Townsend's Big-eared Bat
Eptesicus fuscus (Beauvois)	Big Brown Bat
Euderma maculatum (J. A. Allen)	Spotted Bat
Lasionycteris noctivagans (Le Conte)	Silver-haired Bat
Lasiurus blossevillii (Lesson and Garnot)	Western Red Bat
Lasiurus cinereus (Palisot de Beauvois)	Hoary Bat
Myotis californicus (Audubon and Bachman)	California Myotis
Myotis ciliolabrum (Merriam)	Western Small-footed Myotis
Myotis evotis (H. Allen)	Western Long-eared Myotis
Myotis keenii (Merriam)	Keen's Long-eared Myotis
Myotis lucifugus (Le Conte)	Little Brown Myotis
Myotis septentrionalis (Trouessart)	Northern Long-eared Myotis
Myotis thysanodes Miller	Fringed Myotis
Myotis volans (H. Allen)	Long-legged Myotis
Myotis yumanensis (H. Allen)	Yuma Myotis

ORDER LAGOMORPHA: LAGOMORPHS

FAMILY OCHOTONIDAE: PIKAS

Ochotona collaris (Nelson)	Collared Pika
Ochotona princeps (Richardson)	Common Pika

FAMILY LEPORIDAE: HARES AND RABBITS

Lepus americanus Erxleben	Snowshoe Hare
Lepus townsendii Bachman	White-tailed Jackrabbit
Oryctolagus cuniculus (Linnaeus)	European Rabbit (I)
Sylvilagus floridanus (J. A. Allen)	Eastern Cottontail (I)
Sylvilagus nuttallii (Bachman)	Nuttall's Cottontail

ORDER RODENTIA: RODENTS

FAMILY APLODONTIIDAE: MOUNTAIN BEAVERS

Aplodontia rufa (Rafinesque)	Mountain Beaver

FAMILY SCIURIDAE: SQUIRRELS

Glaucomys sabrinus (Shaw)	Northern Flying Squirrel
Marmota caligata (Eschscholtz)	Hoary Marmot
Marmota flaviventris (Audubon and Bachman)	Yellow-bellied Marmot
Marmota monax (Linnaeus)	Woodchuck
Marmota vancouverensis Swarth	Vancouver Island Marmot
Sciurus carolinensis Gmelin	Eastern Grey Squirrel (I)
Sciurus niger Linnaeus	Eastern Fox Squirrel (I)
Spermophilus columbianus (Ord)	Columbian Ground Squirrel
Spermophilus lateralis (Say)	Golden-mantled Ground Squirrel
Spermophilus parryii (Richardson)	Arctic Ground Squirrel
Spermophilus saturatus (Rhoads)	Cascade Mantled Ground Squirrel
Tamias amoenus J. A. Allen	Yellow-pine Chipmunk
Tamias minimus Bachman	Least Chipmunk
Tamias ruficaudus (A. H. Howell)	Red-tailed Chipmunk
Tamias townsendii Bachman	Townsend's Chipmunk
Tamiasciurus douglasii (Bachman)	Douglas' Squirrel
Tamiasciurus hudsonicus (Erxleben)	Red Squirrel

FAMILY GEOMYIDAE: POCKET GOPHERS

Thomomys talpoides (Richardson)	Northern Pocket Gopher

FAMILY HETEROMYIDAE: HETEROMYIDS

Perognathus parvus (Peale)	Great Basin Pocket Mouse

FAMILY CASTORIDAE: BEAVERS

Castor canadensis Kuhl	Beaver

FAMILY MURIDAE: RATS, MICE, VOLES, AND LEMMINGS

Subfamily Arvicolinae: Voles And Lemmings

Clethrionomys gapperi (Vigors)	Southern Red-backed Vole
Clethrionomys rutilus (Pallas)	Northern red-backed Vole
Lemmus trimucronatus (Richardson)	Brown Lemming
Microtus longicaudus (Merriam)	Long-tailed vole
Microtus montanus (Peale)	Montane Vole
Microtus oeconomus (Pallas)	Tundra Vole
Microtus oregoni (Bachman)	Creeping Vole
Microtus pennsylvanicus (Ord)	Meadow Vole
Microtus richardsoni (DeKay)	Water Vole
Microtus townsendii (Bachman)	Townsend's Vole
Ondatra zibethicus (Linnaeus)	Muskrat
Phenacomys intermedius Merriam	Heather Vole
Synaptomys borealis (Richardson)	Northern Bog Lemming

Subfamily Murinae: Old World Rats and Mice

Mus musculus Linnaeus	House Mouse (I)
Rattus norvegicus (Berkenhout)	Norway Rat (I)
Rattus rattus (Linnaeus)	Black Rat (I)

Subfamily Sigmodontinae: New World Rats and Mice

Neotoma cinerea (Ord)	Bushy-tailed Woodrat
Peromyscus keeni (Rhoads)	Keen's Mouse
Peromyscus maniculatus (Wagner)	Deer Mouse
Reithrodontomys megalotis (Baird)	Western Harvest Mouse

FAMILY DIPODIDAE: JUMPING MICE AND JERBOAS

Zapus hudsonius (Zimmermann)	Meadow Jumping Mouse
Zapus princeps J. A. Allen	Western Jumping Mouse
Zapus trinotatus Rhoads	Pacific Jumping Mouse

FAMILY ERETHIZONTIDAE: NEW WORLD PORCUPINES

Erethizon dorsatum (Linnaeus)	Porcupine

Key To Mammalian Orders

A. KEY TO WHOLE ANIMALS

1a. Tail prehensile, clawless opposable thumb on hind foot (Fig. 1),
females with a marsupium .... **Didelphimorphia-Opossums**[1]
1b. Tail not prehensile, no opposable thumb on hind foot,
females without a marsupium 2

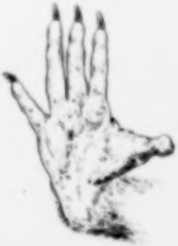

FIGURE 1

2a. Forelimb modified into a wing .... **Chiroptera-Bats** (p. 16)
2b. Forelimb not modified into a wing 3

3a. Pointed snout that extends well beyond the mouth,
eyes tiny .... **Insectivora-Insectivores** (p. 11)
3b. Snout not strongly pointed and not extending well beyond mouth,
eyes not tiny 4

4a. Tail "powder-puff' like, two pairs of upper incisors
.... **Lagomorpha-Lagomorphs** (p. 19)
4b. Tail not "powder-puff" like, one pair of upper incisors
.... **Rodentia-Rodents** (p. 20)

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[1] Only one species occurs in the province, the North American Opossum (*Didelphis virginiana*)

B. KEY TO SKULLS

1a. Five pairs of upper incisor teeth, angle of ramus of mandible directed medially (Fig. 2) .... **Marsupialia–Opossums**

1b. Less than 5 pairs of upper incisors, angle of ramus of mandible directed posteriorly (Fig. 3) 2

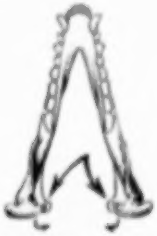

FIGURE 2

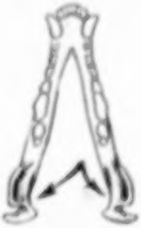

FIGURE 3

2a. No canine teeth, incisors separated from cheek teeth by a large gap 3

2b. Canine teeth present, no gap separating incisors from cheek teeth 4

3a. Two pairs of upper incisors, side of rostrum extensively fenestrate (Fig. 4) .... **Lagomorpha–Lagomorphs** (p. 36)

3b. One pair of upper incisors, side of rostrum not extensively fenestrate .... **Rodentia–Rodents** (p. 38)

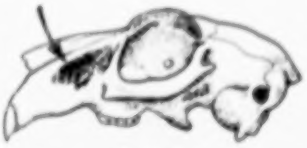

FIGURE 4

4a. Canine teeth large and conspicuous, differentiated from adjacent teeth, anterior edge of bony palate strongly notched between incisors (Fig. 5) .... **Chiroptera–Bats** (p.33)

4b. Canine teeth inconspicuous, not differentiated from adjacent teeth, anterior edge of bony palate not strongly notched between incisors (Fig. 6) .... **Insectivora–Insectivores** (p. 29)

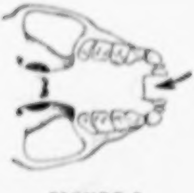

FIGURE 5

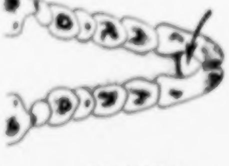

FIGURE 6

Key To Whole Animals

This key is intended for use on restrained or anaesthetized live animals, dead animals, or museum study skins. You will require a millimetre rule or metric callipers for body measurements (Fig. 7, p. 12) and a metric (grams) weigh scale. A magnifying device is essential for examining dental traits such as the relative size of the unicuspid teeth or medial tines of the upper incisors of shrews, or the presence of grooves on the upper incisor teeth of rodents. A dissecting microscope is ideal but, if you are working in difficult field conditions, a portable hand lens with a battery-powered light source will suffice. You can expose the teeth by pushing up the lips and gently opening the mouth.

A. SHREWS AND MOLES (INSECTIVORA)

Some insectivore species can be identified from pelage colour, morphology of the feet, or body size, but the identification of most shrews is based on dental characters. Specimens that are badly decomposed or mutilated from insects, slugs or other predators may be impossible to identify from external traits. Old individuals with badly worn teeth are also problematic. For these individuals, voucher specimens should be preserved for identification by an expert. The user should be aware that several species of shrews that occur in the province (e.g., Preble's Shrew, *Sorex preblei*) are impossible to distinguish from external traits and their identification can only be made by examination of a cleaned skull.

1a. Front feet large with broad palms and long claws (Fig. 8) 11
(Talpidae–Moles)

1b. Front feet not enlarged, palms not broad, claws not long (Fig. 9) 2
(Soricidae–Shrews)

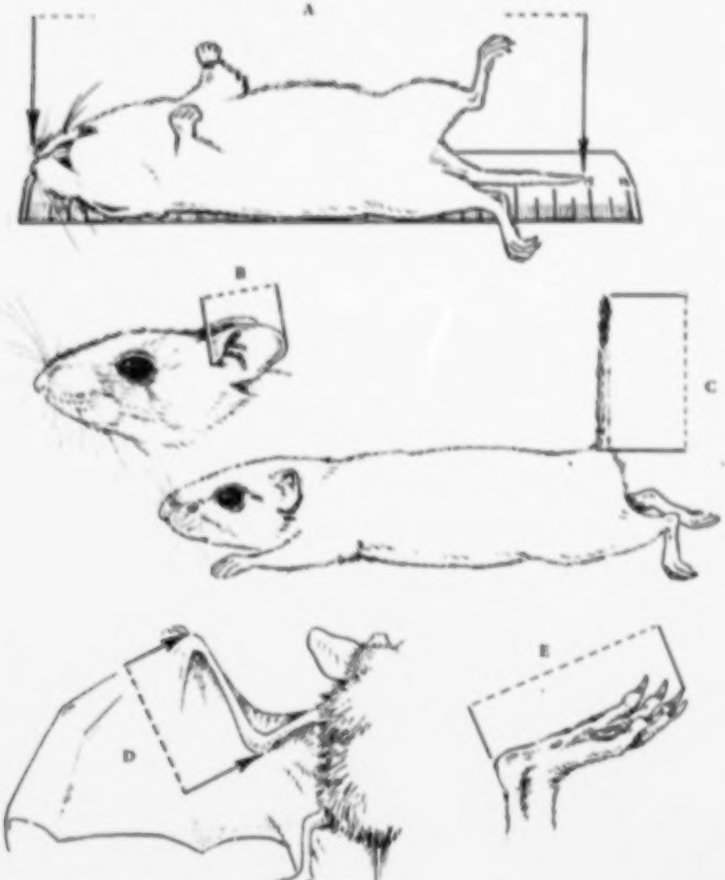

FIGURE 7. SMALL MAMMAL BODY MEASUREMENTS. A: TOTAL LENGTH, B: EAR LENGTH, C: TAIL VERTEBRAE LENGTH, D: FOREARM LENGTH, E: HIND FOOT LENGTH

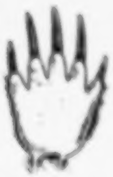

FIGURE 8

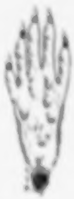

FIGURE 9

2a. Total length greater than 130 mm, hind foot length greater than 18 mm, hind foot with a fringe of stiff hairs (Fig. 10) 3
2b. Total length less than 130 mm, hind foot length less than 18 mm, hind foot lacking a fringe of stiff hairs (Fig. 11) 4

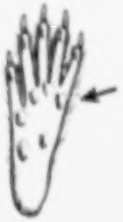

FIGURE 10

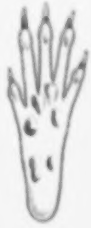

FIGURE 11

3a. Dorsal fur black, feet and belly grey or silver-grey, tail distinctly bicoloured with a paler underside .... **Common Water Shrew** (*Sorex palustris*)
3b. Dorsal fur dark brown, feet and belly dark brown, tail dark brown and not bicoloured .... **Pacific Water Shrew** (*Sorex bendirii*)

4a. When head is viewed laterally 3 unicuspid teeth are visible in the upper jaw (Fig. 12), tail length usually less than 40% of the total length .... **Pygmy Shrew**(*Sorex hoyi*)
4b. When head is viewed laterally 5 unicuspid teeth are visible in the upper jaw (Fig. 13), tail length usually greater than 40% of the total length 5

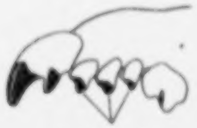

FIGURE 12

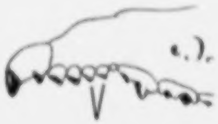

FIGURE 13

5a. When head is viewed laterally, the 3rd unicuspid tooth larger than 4th unicuspid (Fig. 13) 6

5b. When head is viewed laterally, the 3rd unicuspid tooth smaller than 4th unicuspid (Fig. 14) 9

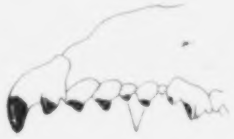

FIGURE 14

6a. First upper incisor lacks a medial tine (Fig. 15) .... **Merriam's Shrew** (*Sorex merriami*)

6b. First upper incisor with a medial tine (Figs. 16, 17) 7

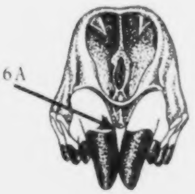

FIGURE 15

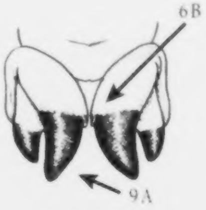

FIGURE 16

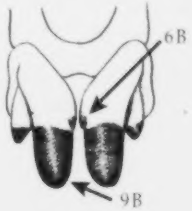

FIGURE 17

7a. Pelage appears tricoloured with the fur on the back contrasting sharply from the paler sides and belly, body weight usually greater than 5.0 grams 8

7b. Pelage does not appeared tricoloured and the fur on the back does not contrast sharply from the sides, body weight usually less than 5.0 grams .... **Common Shrew** (*Sorex cinereus*) OR **Preble's Shrew** (*Sorex preblei*)[2]

8a. Fur on back blackish, fur on belly dark brown, tail length greater than 37 mm .... **Black-backed Shrew** (*Sorex arcticus*)

8b. Fur on back brown, fur on belly grey, tail length less than 37 mm .... **Tundra Shrew** (*Sorex tundrensis*)

9a. Tail distinctly bicoloured, dark on dorsal surface and white underneath, medial edge of 1st upper incisor curved in front view (Fig. 16) .... **Trowbridge's Shrew** (*Sorex trowbridgii*)

9b. Tail not distinctly bicoloured, underside of tail pale brown or grey, medial edge of 1st upper incisor straight in front view (Fig. 17) 10

[2] Preble's Shrew (*Sorex preblei*) and the Common Shrew (*Sorex cinereus*) can only be distinguished by measurements taken from a cleaned skull.

10a. Five or more toe pads on toes 2 to 5 (Fig. 18), medial tine on 1st upper incisor positioned below the pigmented area (Fig. 19) .... **Dusky Shrew** (*Sorex monticolus*)

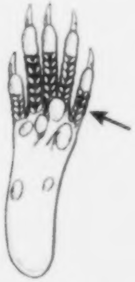

FIGURE 18

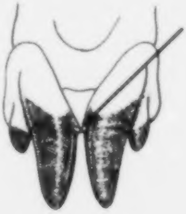

FIGURE 19

10b. Four or less toe pads on toes 2 to 5 (Fig. 20), medial tine on 1st upper incisor positioned at or above the pigmented area (Fig. 21) .... **Vagrant Shrew** (*Sorex vagrans*)

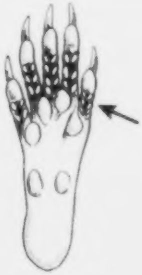

FIGURE 20

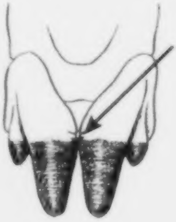

FIGURE 21

11a. Tail length about one half of the head and body length, width of forefoot palm less than its length (Fig. 22) .... **Shrew-mole** (*Neurotrichus gibbsii*)

11b. Tail length less than one half of the head and body length, width of forefoot palm equal or greater than its length (Fig. 23) **12**

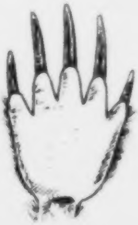

FIGURE 22

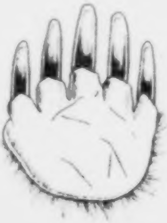

FIGURE 23

12a. Total length greater than 175 mm, hind foot length greater than 24 mm
.... **Townsend's Mole** (*Scapanus townsendii*)
12b. Total length less than 175 mm, hind foot length less than 24 mm
.... **Coast Mole** (*Scapanus orarius*)

B. BATS (CHIROPTERA)

Fur colour, external measurements (Fig. 7, p.12) especially forearm length and ear length, and the presence or absence of a keel on the calcar are the most important traits for identifying live bats or museum study skins. The diagnostic characteristics used in the keys are of adult bats. Nursing young cannot be identified with this key and some of the size criteria cannot be applied to immature bats that have not reached their full adult size. Immature bats can be distinguished from adults by the swollen finger joints (Fig. 24) and dull dark fur of the immatures. Note that although ear length is used in several sections of the key to separate species, this trait has a high measuring error. Keen's Long-eared Myotis (*Myotis keenii*) and Western Long-eared Myotis (*Myotis evotis*) cannot be reliably identified from external traits and their identification requires a cleaned skull. There are several other species of bats (e.g., Yuma Myotis, *Myotis yumanensis* vs. Little Brown Myotis, *Myotis lucifugus*) where some individuals are impossible to identify with a 100 percent certainty from their external features alone and positive identification may require a voucher specimen.

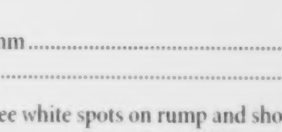

FIGURE 24

1a. Ear length greater than 28 mm 2
1b. Ear length less than 28 mm 4

2a. Dorsal fur jet black with three white spots on rump and shoulders
.... **Spotted Bat** (*Euderma maculatum*)
2b. Dorsal fur not jet black and lacking white spots 3

3a. Nose with two prominent bumps, forearm length 40-45 mm
.... **Townsend's Big-eared Bat** (*Corynorhinus townsendii*)
3b. Nose lacking two prominent bumps, forearm length 48-57 mm
.... **Pallid Bat** (*Antrozous pallidus*)

4a. Fur orange or rusty red in colour
.... **Western Red Bat** (*Lasiurus blossevillii*)
4b. Fur not orange or rusty red 5

5a. Fur on back with frosted or silver-tipped hairs 6
5b. Fur on back without frosted or silver-tipped hairs 7

6a. Upper surface of tail membrane covered with fur,
forearm length 50-57 mm .... **Hoary Bat** (*Lasiurus cinereus*)
6b. Upper surface of tail membrane furred only at the base,
forearm length 39-44 mm .... **Silver-haired Bat** (*Lasionycteris noctivagans*)

7a. Obvious (visible with the naked eye) fringe of hairs on outer edge
of tail membrane (Fig. 25) .... **Fringed Myotis** (*Myotis thysanodes*)
7b. No obvious (visible with the naked eye) fringe of hairs on outer edge,
of tail membrane (Fig. 26) 8

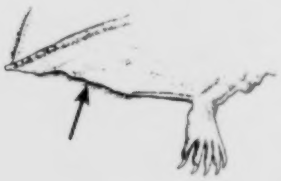

FIGURE 25

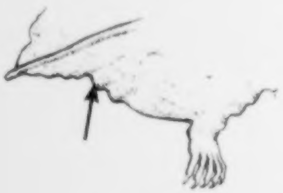

FIGURE 26

8a. Calcar with a prominent keel (Fig. 27) 9
8b. Calcar without a prominent keel (Fig. 28) 12

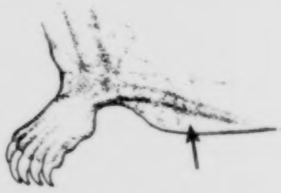

FIGURE 27

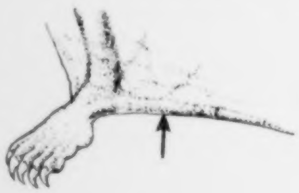

FIGURE 28

9a. Forearm length greater than 35 mm, hind foot length greater than 9 mm 10
9b. Forearm length less than 35 mm, hind foot length less than 9 mm 11

10a. Underwing furred outward to a line extending from knee to elbow (Fig. 29),
forearm length 34-44 mm .... **Long-legged Myotis** (*Myotis volans*)
10b. Underwing not furred outward to a line extending from knee to elbow (Fig. 30),
forearm length 43-52 mm .... **Big Brown Bat** (*Eptesicus fuscus*)

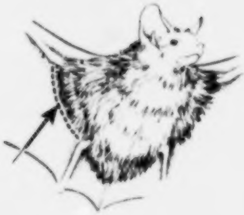

FIGURE 29

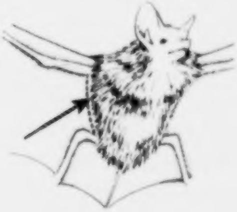

FIGURE 30

11a. Fur on back pale blonde to orange-yellow, contrasts sharply with blackish ears, face, and wings; length of bare area on snout about 1.5 times width across nostrils (Fig. 31) .... **Western Small-footed Myotis** (*Myotis ciliolabrum*)

11b. Fur on back chestnut to brown, does not contrast sharply in colour with ears, face, and wings; length of bare area on snout about equal to width across nostrils (Fig. 32) .... **California Myotis** (*Myotis californicus*)

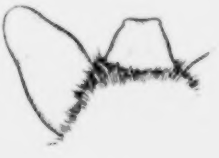

FIGURE 31

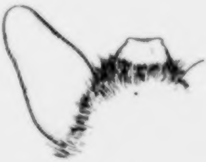

FIGURE 32

12a. Ears long (14-22 mm), usually extending far beyond tip of nose when pushed forward **13**

12b. Ears short (10-16 mm), usually not extending far beyond tip of nose when pushed forward **14**

13a. Ear length usually less than 18 mm, no distinct shoulder patches, tail membrane lacking a fringe of tiny hairs (viewed with hand lens) .... **Northern Long-eared Myotis** (*Myotis septentrionalis*)

13b. Ear length usually greater than 18 mm, usually distinct shoulder patches, tail membrane with a fringe of tiny hairs (viewed with a hand lens) .... **Keen's Long-eared Myotis** (*Myotis keenii*) OR **Western Long-eared Myotis** (*Myotis evotis*)[1]

14a. Fur on back long, sleek, and glossy, forearm length usually greater than 36 mm .... **Little Brown Myotis** (*Myotis lucifugus*)

14b. Fur on back short and dull, forearm length usually less than 36 mm .... **Yuma Myotis** (*Myotis yumanensis*)

---

[1] The Western Long-eared Myotis (*Myotis evotis*) generally has a longer forearm and ear than Keen's Long-eared Myotis (*Myotis keenii*) but because their forearm and ear length measurements overlap extensively they can not be identified from external traits. *Myotis keenii* can only be reliably discriminated from *Myotis evotis* with skull measurements.

C. HARES, RABBITS, AND PIKAS (LAGOMORPHA)

The pikas are easily distinguished from hares and rabbits by their small size and short ears (see Fig. 7 for body measurements). In most areas of the province, the only species of hare or rabbit is the Snowshoe Hare (*Lepus americanus*) and identification is straightforward. However, identification can be problematic in areas where the Snowshoe Hare co-occurs with cottontail species (e.g., lower Fraser Valley or Okanagan Valley) or regions where the Eastern Cottontail coexists with feral populations of the European rabbit (e.g., southern Vancouver Island). Although the Snowshoe Hare generally turns white in winter, animals in summer pelage resemble the pelage colour of cottontails. Positive identjfication of problematic or immature animals may require voucher specimens.

1a. Ears short (ear length less than 40 mm) and rounded, no visible external tail **2**
1b. Ears long (ear length greater than 40 mm) and elongated, visible external tail **3**

2a. Dorsal pelage grey with an indistinct pale grey collar on neck and shoulders, ventral pelage whitish .... **Collared Pika** (*Ochotona collaris*)
2b. Dorsal pelage brown with no distinct grey collar on neck or shoulders, ventral pelage grey .... **Common Pika** (*Ochotona princeps*)

3a. Rufous or brown nape on back of head (Fig. 33) **5**
3b. No nape on the back of head (Fig. 34) **4**

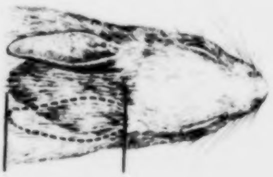

FIGURE 33

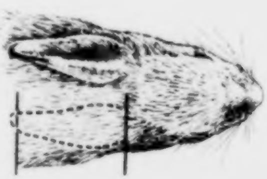

FIGURE 34

4a. Ear length greater than 100 mm .... **White-tailed Jackrabbit** (*Lepus townsendii*)
4b. Ear length less than 100 mm .... **Snowshoe Hare** (*Lepus americanus*)

5a. Ear length usually greater than 80 mm, total length greater than 490 mm .... **European Rabbit** (*Oryctolagus cuniculus*)
5b. Ear length usually less than 80 mm, total length less than 490 mm **6**

6a. Pelage dull grey colour, weight less than 700 g, ear length less than 60 mm .... **Nuttall's Cottontail** (*Sylvilagus nuttallii*)
6b. Pelage brownish, weight greater than 700 g, ear length greater than 60 mm .... **Eastern Cottontail** (*Sylvilagus floridanus*)

D. RODENTS (RODENTIA)

Diagnostic external traits for identifying this diverse group include pelage colour and markings, relative size of the tail, hind foot length, and head and body length (see Fig. 7 for body measurements). Some species are exceedingly difficult, if not impossible, to identify confidently from external characters. Positive identification of many of the arvicoline rodents (voles, lemmings) for example, may require an examination of skulls for various cranial or dental characters. In some parts of the province, an examination of the male or female genital bones is necessary to identify chipmunks (*Tamias*). Note that immature animals can be problematic to identify from criteria based on absolute size; some pelage traits (e.g., the median reddish stripe of red-backed voles *Clethrionomys*) may be indistinct in immature individuals.

1a. Upper part of body covered with long stiff quills .... **Porcupine** (*Erethizon dorsatum*)
1b. Upper part of body not covered with long stiff quills 2

2a. Hind foot webbed 3
2b. Hind foot not webbed 4

3a. Broad tail flattened dorsal-ventrally, head and body length greater than 400 mm .... **Beaver** (*Castor canadensis*)
3b. Tail flattened laterally, not broad, head and body length less than 400 mm .... **Muskrat** (*Ondatra zibethicus*)

4a. Tail with long hairs and bushy (Fig. 35) 5
4b. Tail without long hairs and not bushy (Fig. 36) 22

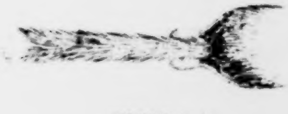

FIGURE 35

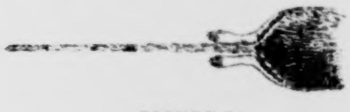

FIGURE 36

5a. Vibrissae extending well beyond ears to shoulders, underside of tail white, 5 digits on front foot .... **Bushy-tailed Woodrat** (*Neotoma cinerea*)
5b. Vibrissae not extending well beyond ears, underside of tail not white, 4 digits on front foot 6

6a. Tail flattened in appearance, skin on side of body extends between front and hind legs to form a gliding membrane .... **Northern Flying Squirrel** (*Glaucomys sabrinus*)

6b. Tail not flattened, no gliding membrane present on side of body 7

7a. Light and dark longitudinal stripes present on the back 8

7b. No stripes present on the back 13

8a. Light and dark stripes present on side of head, stripes on body consist of 5 black and 4 light stripes 9

8b. No stripes on the side of head, stripes on body consist of 4 black and 2 light stripes 12

9a. The four pale body stripes indistinct, hairs on the dorsal surface of the tail with white or grey tips .... **Townsend's Chipmunk** (*Tamias townsendii*)

9b. The four pale body stripes distinct, hairs on the dorsal surface of the tail with pale yellow to rufous tips 10

10a. Total length usually less than 195 mm; belly fur whitish-grey .... **Least Chipmunk** (*Tamias minimus*)[1]

10b. Total length usually greater than 195 mm; belly fur buffy or whitish-grey 11

11a. Belly fur usually buffy, underside of tail orange .... **Yellow-pine Chipmunk** (*Tamias amoenus*)[1]

11b. Belly fur usually whitish, underside of tail rufous .... **Red-tailed Chipmunk** (*Tamias ruficaudus*)[1]

12a. Prominent black stripes bordering the two light stripes on back, a conspicuous mantle of brown or reddish hairs on neck and shoulders (Fig. 37) .... **Golden-mantled Ground Squirrel** (*Spermophilus lateralis*)

12b. Black stripes bordering the two light stripes on back are indistinct or absent, mantle on neck and shoulders inconspicuous or absent (Fig. 38) .... **Cascade Mantled Ground Squirrel** (*Spermophilus saturatus*)

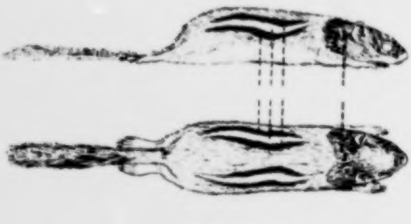

FIGURE 37

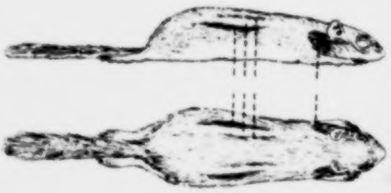

FIGURE 38

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[1] Because size and belly fur colour varies geographically among subspecies of these species, in some areas of the province these 3 chipmunk species are impossible to distinguish from fur colour or size. They can only be positively identified from skulls or genital bone morphology.

13a. Dorsal pelage with spotted or mottled pattern 14
13b. Dorsal pelage not spotted or mottled 15

14a. Side of neck tawny brown, ventral side of tail predominately reddish
with black tip, hind legs and dorsal surface of feet grey to yellowish-brown
.... **Arctic Ground Squirrel** (*Spermophilus parryii*)
14b. Side of neck greyish, ventral side of tail a mix of black and white,
hind legs and dorsal surface of hind feet reddish-brown
.... **Columbian Ground Squirrel** (*Spermophilus columbianus*)

15a. Body heavy and stout, tail length less than 50% head and body length 16
15b. Body not heavy and stout, tail length about equal to head and body length 19

16a. Posterior pad on sole of hind foot oval in shape (Fig. 39) 17
16b. Posterior pad on sole of hind foot circular in shape (Fig. 40) 18

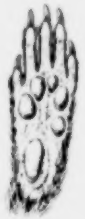

FIGURE 39

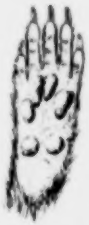

FIGURE 40

17a. Dorsal surface of feet dark brown; side of neck grizzled brown,
neck not distinct from side or back .... **Woodchuck** (*Marmota monax*)
17b. Dorsal surface of feet yellowish to buffy; side of neck uniform buffy
to yellow, neck paler than side or back
.... **Yellow-bellied Marmot** (*Marmota flaviventris*)

18a. Dorsal pelage grizzled with a mix of white and black; individual guard hairs
bicoloured or tricoloured .... **Hoary Marmot** (*Marmota caligata*)
18b. Dorsal pelage light to chocolate brown not grizzled; individual guard hairs
unicoloured .... **Vancouver Island Marmot** (*Marmota vancouverensis*)

19a. Head and body length greater than 220 mm, tail vertebrae length
greater than 190 mm, hind foot length greater than 60 mm 20
19b. Head and body length less than 190 mm, tail vertebrae length
less than 190 mm, hind foot length less than 60 mm 21

20a. Dorsal pelage rust grey, ventral pelage yellow or orange, tips of tail hairs and
tufts behind ears reddish-orange .... **Eastern Fox Squirrel** (*Sciurus niger*)
20b. Dorsal pelage grey, ventral pelage whitish, tips of tail hairs and
tufts of hairs behind ears whitish OR melanic with pelage black
or dark brown .... **Eastern Grey Squirrel** (*Sciurus carolinensis*)

21a. Ventral pelage predominately yellow or orange, ... **Douglas' Squirrel** (*Tamiasciurus douglasii*)
21b. Ventral pelage predominately white or grey .... **Red Squirrel** (*Tamiasciurus hudsonicus*)

22a. External cheek pouches present on each side of the mouth (Fig. 41) **23**
22b. No external cheek pouches present on side of mouth **24**

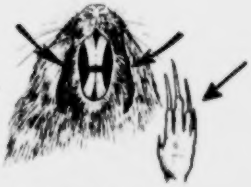

FIGURE 41

23a. Front feet with long claws (Fig. 41), tail no more than 50% of head and body length .... **Northern Pocket Gopher** (*Thomomys talpoides*)
23b. Front feet without long claws, tail longer than head and body length .... **Great Basin Pocket Mouse** (*Perognathus parvus*)

24a. Tail markedly shorter than hind foot length and not readily visible, long claws on front feet (Fig. 41) .... **Mountain Beaver** (*Aplodontia rufa*)
24b. Tail equal to or longer than hind foot length and readily visible, front feet without long claws **25**

25a. Conspicuous eyes and ears, ears not concealed in fur, long tail, sleek body (Fig. 42) .... **26 ("mice and rats")**
25b. Inconspicuous eyes and ears, ears concealed in fur, tail short, body stocky (Fig. 43) .... **34 ("voles and lemmings")**

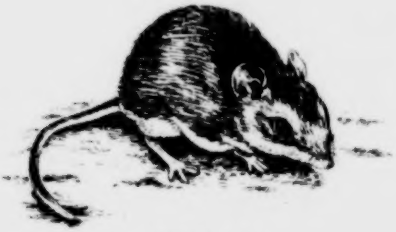

FIGURE 42

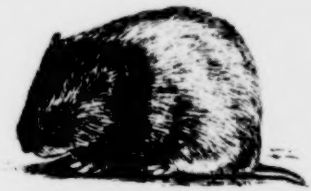

FIGURE 43

26a. Tail nearly naked, scaly with annulations readily visible (Fig. 44) **27**
26b. Tail haired, scales and annulations not readily visible (Fig. 45) **32**

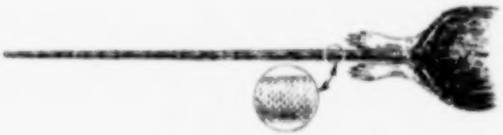

FIGURE 44

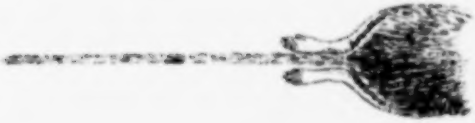

FIGURE 45

27a. Hind legs and hind feet greatly elongated (Fig. 46) 28
27b. Hind legs and hind feet not elongated 30

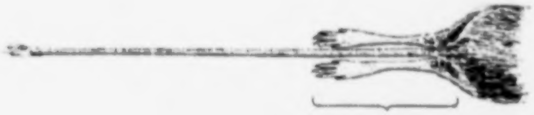

FIGURE 46

28a. Ventral pelage typically pure white with no buffy wash, usually no buffy patches on chest, throat, or belly .... **Western Jumping Mouse** (*Zapus princeps*)[5]
28b. Ventral pelage white typically with buffy wash, buffy patches often on chest, throat, or belly 29

29a. Total length usually greater than 230 mm, tail vertebrae length usually greater than 140 mm .... **Pacific Jumping Mouse** (*Zapus trinotatus*)[5]
29b. Total length usually less than 230 mm, tail vertebrae length usually less than 140 mm .... **Meadow Jumping Mouse** (*Zapus hudsonius*)[5]

30a. Hind foot length less than 20 mm, weight less than 30 g .... **House Mouse** (*Mus musculus*)
30b. Hind foot length greater than 20 mm, weight greater than 30 g 31

---

[5] The jumping mice show considerable geographic variation in size and ventral fur colour. In areas of the province where two species co-occur, positive identification requires a skull.

31a. Tail longer than head and body length, snout pointed, rump light and slender (Fig. 47) .... **Black Rat** (*Rattus rattus*)
31b. Tail less than head and body length, snout blunt, rump thick and heavy (Fig. 48) .... **Norway Rat** (*Rattus norvegicus*)

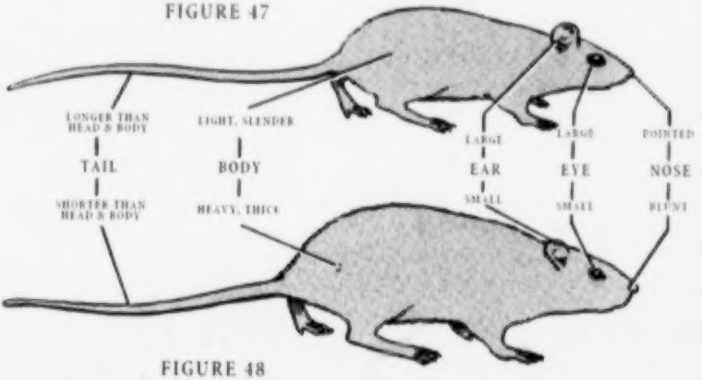

FIGURE 47

FIGURE 48

32a. Total length of adults less than 150 mm, adult weight less than 15 g, distinct groove on anterior face of upper incisors (Fig. 49) .... **Western Harvest Mouse** (*Reithrodontomys megalotis*)
32b. Total length of adults greater than 150 mm, adult weight greater than 15 g, upper incisors without a groove (Fig. 50) **33**

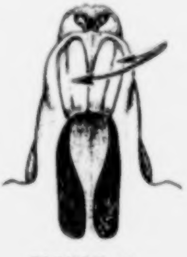

FIGURE 49

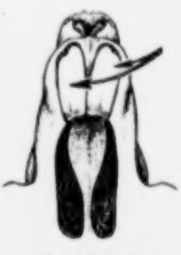

FIGURE 50

33a. Tail vertebrae length of adults less than 98 mm .... **Deer Mouse** (*Peromyscus maniculatus*)[*]
33b. Tail vertebrae length of adults greater than 98 mm .... **Keen's Mouse** (*Peromyscus keeni*)[*]

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[*] Tail length will only discriminate adults. This trait is not completely reliable as there is some overlap among the two species. Moreover, the diagnostic measurement of 98 mm is derived from a few island and mainland samples of *Peromyscus maniculatus* and *Peromyscus keeni* from southwestern British Columbia that were identified from genetic criteria. The reliability of this diagnostic measurement for discriminating the two species of *Peromyscus* in other regions needs to be assessed.

34a. Dorsal pelage with broad chestnut or rufous-brown median stripe 35
34b. Dorsal pelage lacking broad chestnut or rufous-brown median stripe 36

35a. Tail densely furred, tail with yellow on the underside
.... **Northern Red-backed Vole** (*Clethrionomys rutilus*)
35b. Tail sparsely furred, tail with white or grey on the underside
.... **Southern Red-backed Vole** (*Clethrionomys gapperi*)

36a. Tail vertebrae length less than 50 mm 37
36b. Tail vertebrae length greater than 50 mm 43

37a. Tail roughly the same length as the hind foot, tail vertebrae length less than 20% of total length 38
37b. Tail distinctly longer than hind foot, tail vertebrae length greater than 20% of total length 39

38a. Tail sparsely furred, dorsal pelage short and grey or dull brown, upper incisor with a groove (Fig. 49)
.... **Northern Bog Lemming** (*Synaptomys borealis*)
38b. Tail densely furred, dorsal pelage long and orange to brown, upper incisors not grooved (Fig. 50)
.... **Brown Lemming** (*Lemmus trimucronatus*)

39a. Fur short and velvety, eye diameter less than 3 mm
.... **Creeping Vole** (*Microtus oregoni*)
39b. Fur not short and velvety, eye diameter greater than 3 mm 40

40a. Tail thin, not thickened at base, and sparsely furred, body fur soft and fine
.... **Heather Vole** (*Phenacomys intermedius*)
40b. Tail not thin, thickened at base, and covered in hairs, body fur coarse 41

41a. Pelage grizzled grey-brown or salt and pepper appearance, tops of hind feet whitish to grey
.... **Montane Vole** (*Microtus montanus*)
41b. Pelage brown, not a salt and pepper pattern, tops of hind feet dark brown to nearly black 42

42a. Dorsal pelage with tinges of yellow on flanks and rump, underparts pale yellow, tail strongly bicoloured
.... **Tundra Vole** (*Microtus oeconomus*)[*]
42b. Dorsal pelage lacking yellow tinge on flanks and rump, underparts grey, tail not strongly bicoloured
.... **Meadow Vole** (*Microtus pennsylvanicus*)[*]

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[*] Positive identification of these two species may require an examination of the morphology of the 2nd upper molar in the skull.

43a. Hind foot usually greater than 26 mm, adult body weight usually
greater than 100 g .... **Water Vole** (*Microtus richardsoni*)
43b. Hind foot length usually less than 26 mm, adult body weight
less than 100g 44

44a. Tail vertebrae length usually 33% or more of the total length
.... **Long-tailed Vole** (*Microtus longicaudus*)
44b. Tail vertebrae length usually less than 33% of the total length
.... **Townsend's Vole** (*Microtus townsendii*)

Key to Skulls

This key is based on cranial and dental characters; therefore, it is designed to be used on cleaned skulls prepared as museum specimens (see Ministry of Environment Lands and Parks, Resources Inventory Branch 1999) or skulls recovered from raptor pellets. You will require a dissecting microscope to examine teeth. For insectivores and bats, you can measure skull length with needle-nosed callipers but accurate measurement of palatal length, interorbital width, and toothrow length requires an ocular micrometer in a dissecting microscope. All cranial and dental measurements used in the keys for the lagomorphs and rodents can be taken with needle-nosed callipers. For problematic specimens, voucher specimens should be submitted to a natural history museum for verification.

A. SHREWS AND MOLES (INSECTIVORA)

Important diagnostic criteria include skull size, relative size of the unicuspid teeth (Fig. 51), and position of the medial tine on the first upper incisor. Skull length and palatal length (Fig. 52) are used as two measures of skull size. Although this key is more reliable than the key to whole animals, it has its limitations. Because of their fragility, skulls of insectivores taken in kill traps or recovered in raptor pellets often have broken crania and their skull length cannot be measured. Therefore, palatal length, a measurement that can usually be taken from partial skulls, can be used as an alternate measure of skull size in the key. Skulls of old individuals with badly worn teeth can be difficult to identify because the pigmentation patterns and relative size of their teeth may be obscured. For example, an important trait to distinguish the Dusky Shrew (*Sorex monticolus*) from the Vagrant Shrew (*Sorex vagrans*) is the position of the medial tine on the first upper incisor relative to the pigmented region on this tooth. In old individuals, this pigmented region may be completely worn away.

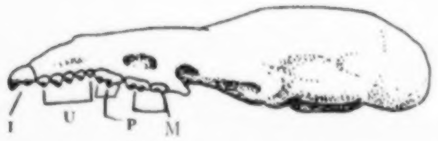


FIGURE 51. SHREW SKULL WITH DIFFERENT TYPES OF TEETH: I: 1ST UPPER INCISOR, U: UNICUSPIDS, P: PREMOLAR, M: MOLARS

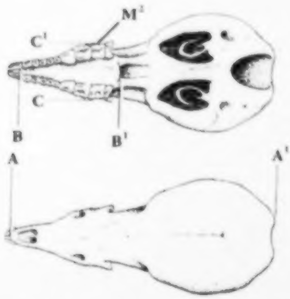


FIGURE 52. INSECTIVORE SKULL MEASUREMENTS: A- A¹: SKULL LENGTH, B-B¹: PALATIAL LENGTH, C-C¹: WIDTH ACROSS 2ND UPPER MOLARS M².

1a. Skull with thin zygomatic arches (Fig. 53), 1st upper incisor not enlarged and lacking a prominent hook (Fig. 54) .... **12 (Talpidae-Moles)**
1b. Skull lacking zygomatic arches (Fig. 55), 1st upper incisor enlarged and with a prominent hook (Fig. 56) .... **2 (Soricidae-Shrews)**

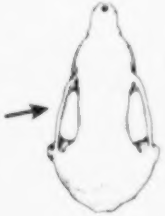


FIGURE 53

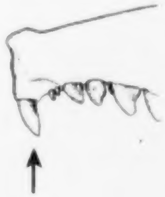


FIGURE 54

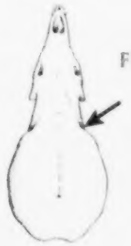


FIGURE 55

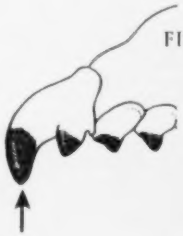


FIGURE 56

2a. When skull viewed laterally, 3 unicuspid teeth visible (Fig. 57) .... **Pygmy Shrew** (*Sorex hoyi*)
2b. When skull viewed laterally, 5 unicuspid teeth visible (Fig. 58, 59) 3

3a. 3rd unicuspid tooth larger than 4th unicuspid (Fig. 58) 4
3b. 3rd unicuspid tooth smaller than 4th unicuspid (Fig. 59) 8

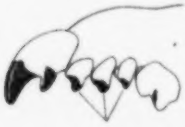


FIGURE 57

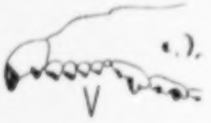


FIGURE 58

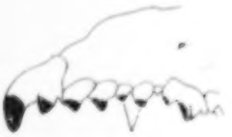


FIGURE 59

4a. First upper incisor lacks a medial tine (Fig. 60) ...... **Merriam's Shrew** (*Sorex merriami*)
4b. First upper incisor with a medial tine (Fig. 64, 66) 5

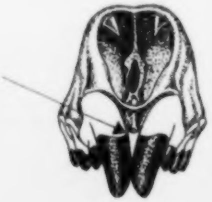


FIGURE 60

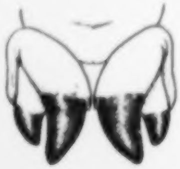


FIGURE 64

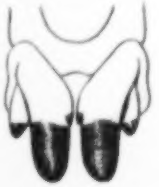


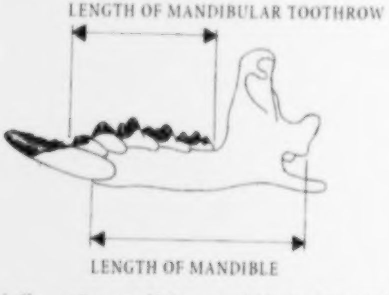
FIGURE 66

5a. Skull length greater than 17.0 mm, palatal length greater than 7.2 mm 6
5b. Skull length less than 17.0 mm, palatal length less than 7.2 mm 7

6a. Skull length greater than 18.5 mm, palatal length greater than 7.7 mm
.... **Black-backed Shrew** (*Sorex arcticus*)
6b. Skull length less than 18.5 mm, palatal length less than 7.7 mm
.... **Tundra Shrew** (*Sorex tundrensis*)

7a. Skull length greater than 14.6 mm, length of mandible greater than 6.5mm (Fig. 61) length of mandibular toothrow greater than 4.3 mm.
.... **Common Shrew** (*Sorex cinereus*)
7b. Skull length less than 14.6 mm, length of mandible less than 6.5 mm (Fig. 61) length of mandibular toothrow less than 4.3 mm .... **Preble's Shrew** (*Sorex preblei*)*

FIGURE 61



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* Because only 4 skulls of Preble's Shrew (*Sorex preblei*) are available for the British Columbian population, the diagnostic measurements that separate this species from Common Shrews (*Sorex cinereus*) inhabiting the southern interior of the province are based on inadequate samples. Any shrew suspected to be Preble's Shrew (*Sorex preblei*) should be kept as a voucher specimen and submitted to a natural history museum for verification.

8a. Skull length greater than 19 mm, palatal length greater than 8.2 mm 9
8b. Skull length less than 19 mm, palatal length less than 8.2 mm 10

9a. Rostrum long and curved ventrally in side view (Fig. 62)
.... **Pacific Water Shrew** (*Sorex bendirii*)
9b. Rostrum short and straight in side view (Fig. 63)
.... **Common Water Shrew** (*Sorex palustris*)

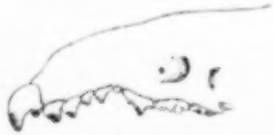

FIGURE 62

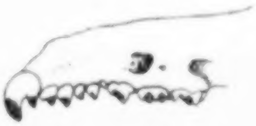

FIGURE 63

10a. Medial edge of 1st upper incisor appears curved in front view (Fig. 64, p. 31), pigmented ridge on upper unicuspids separated from cingulum by a longitudinal groove (Fig. 65)
.... **Trowbridge's Shrew** (*Sorex trowbridgii*)
10b. Medial edge of 1st upper incisor appears straight in front view (Fig. 66, p. 31) pigmented ridge on upper unicuspids not separated from cingulum by a longitudinal ridge (Fig. 67) 11

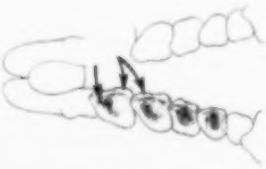

FIGURE 65

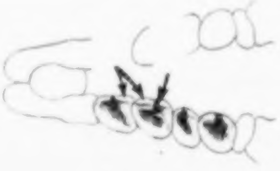

FIGURE 67

11a. Medial tine on 1st upper incisor positioned at or above pigmented region (Fig. 68), width across 2nd upper molars (M^2-M^2, Fig. 52) less than 4.5 mm
.... **Vagrant Shrew** (*Sorex vagrans*)
11b. Medial tine on 1st upper incisor positioned below pigmented region (Fig. 69), width across 2nd upper molars (M^2-M^2) greater than 4.5 mm
.... **Dusky Shrew** (*Sorex monticolus*)

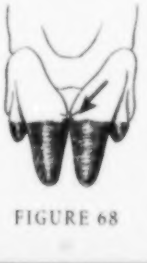

FIGURE 68

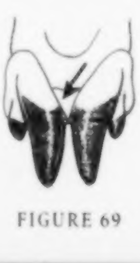

FIGURE 69

12a. Skull length less than 25.0 mm, palatal length less than 13.0 mm,
total of 36 teeth in skull .... **Shrew-mole** (*Neurotrichus gibbsii*)
12b. Skull length more than 25.0 mm, palatal length greater than 13.0 mm,
total of 44 teeth in skull 13

13a. Skull length greater than 37.0 mm, palatal length greater than 16.0 mm
.... **Townsend's Mole** (*Scapanus townsendii*)
13b. Skull length less than 37.0 mm, palatal length less than 16.0 mm
.... **Coast Mole** (*Scapanus orarius*)

B. BATS (CHIROPTERA)

Diagnostic cranial traits include the number of upper incisor and premolar teeth (Fig. 70), cranial measurements (Fig. 71), and the shape of the forehead and braincase. For species separated by skull shape such as the elevation of the braincase or slope of the forehead, comparative reference specimens should be examined to observe the different the different character states used in the key. Most bats can be reliably identified from their skulls. Exceptions are the Little Brown Myotis (*Myotis lucifugus*) and Yuma Myotis (*Myotis yumanensis*), and the three species of long-eared myotis (*Myotis keenii, Myotis septentrionalis,* and *Myotis evotis*). Most *Myotis lucifugus* and *Myotis yumanensis* can be discriminated from each other by skull length and the shape of the forehead. However, in some regions, there may be a few individuals that appear intermediate in their cranial morphology. Skulls of the Long-eared Myotis species are difficult to discriminate in areas where they overlap in their distribution.

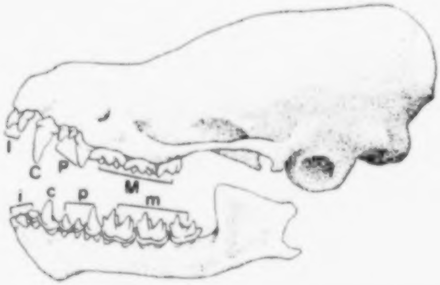

FIGURE 70. TYPES OF TEETH IN BAT SKULLS: **I:** UPPER INCISORS, **i:** LOWER INCISORS, **C:** UPPER CANINE, **c:** LOWER CANINE, **P:** UPPER PREMOLARS, **p:** LOWER PREMOLARS, **M:** UPPER MOLARS, **m:** LOWER MOLARS.

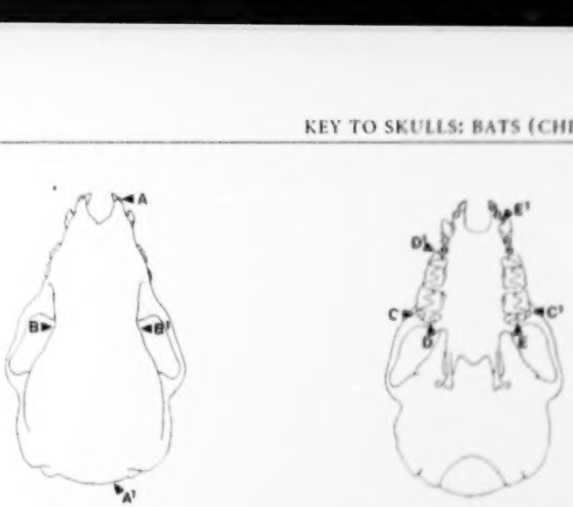

FIGURE 71. BAT SKULL MEASUREMENTS: **A-A^1**: SKULL LENGTH, **B-B^1**: POSTORBITAL WIDTH, **C-C^1**: WIDTH ACROSS FROM LAST UPPER MOLARS (M^3-M^3), **D-D^1** LENGTH FROM LAST UPPER PREMOLAR TO LAST UPPER MOLAR (P^4-M^3), **E-E^1**: LENGTH OF MAXILLARY TOOTHROW.

1a. One upper incisor on each side of skull (Fig. 72) **2**
1b. More than one upper incisor on each side of skull (Fig. 73) **4**

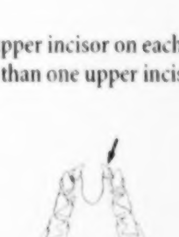

FIGURE 72

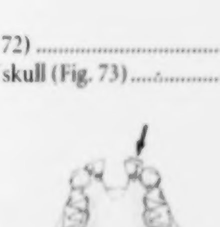

FIGURE 73

2a. One upper premolar on each side of skull (Fig. 74)
.... **Pallid Bat** (*Antrozous pallidus*)
2b. Two upper premolars on each side of skull (Fig. 75) **3**

3a. Skull length greater than 15.0 mm .... **Hoary Bat** (*Lasiurus cinereus*)
3b. Skull length less than 15.0 mm .... **Western Red Bat** (*Lasiurus blossevillii*)

4a. One upper premolar on each side of skull (Fig. 74) ....
.... **Big Brown Bat** (*Eptesicus fuscus*)
4b. More than one upper premolar on each side of skull..**5**

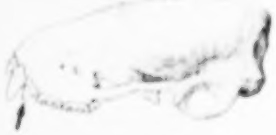

FIGURE 74

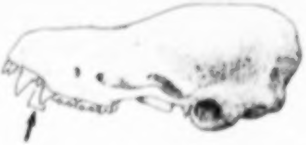

FIGURE 75

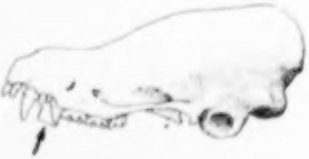

FIGURE 76

5a. Two upper premolars on each side of skull (Fig. 75) 6
5b. Three upper premolars on each side of skull (Fig. 76) 8

6a. Skull length greater than 18.0 mm .... **Spotted Bat** (*Euderma maculatum*)
6b. Skull length less than 18.0 mm 7

7a. Postorbital width greater than 4.0 mm
.... **Silver-haired Bat** (*Lasionycteris noctivagans*)
7b. Postorbital width less than 4.0 mm
.... **Townsend's Big-eared Bat** (*Corynorhinus townsendii*)

8a. Postorbital width greater than 3.4 mm 9
8b. Postorbital width less than 3.4 mm 15

9a. Ratio of postorbital width/upper toothrow length greater than 0.7 mm 10
9b. Ratio of postorbital width/upper toothrow length less than 0.7 mm 12

10a. Braincase strongly elevated (Fig. 77) .... **Long-legged Myotis** (*Myotis volans*)
10b. Braincase not strongly elevated (Fig. 78) 11

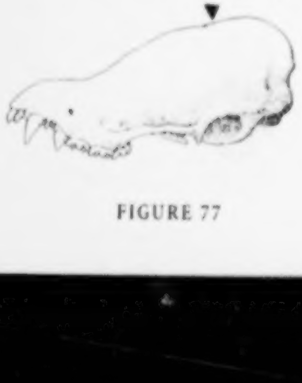

FIGURE 77

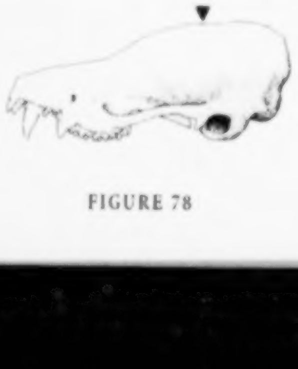

FIGURE 78

11a. Forehead with a steep slope (Fig. 79); skull length usually
less than 14.0 mm .... **Yuma Myotis** (*Myotis yumanensis*)
11b. Forehead with a gradual slope (Fig. 80); skull length usually
greater than 14.0 mm .... **Little Brown Myotis** (*Myotis lucifugus*)

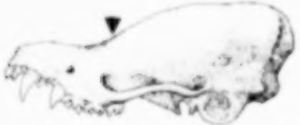

FIGURE 79

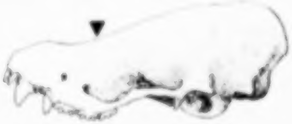

FIGURE 80

12a. Width across last upper molars (M^3-M^3) greater than 6.2 mm
.... **Fringed Myotis** (*Myotis thysanodes*)
12b. Width across last upper molars (M^3-M^3) less than 6.2 mm **13**

13a. Length across upper molars and last premolar (P^4-M^3)
greater than 4.2 mm, maxillary toothrow length greater than 5.8 mm
.... **Western Long-eared Myotis** (*Myotis evotis*)[9]
13b. Length across upper molars and last premolar (P^4-M^3)
less than 4.2 mm, maxillary toothrow length less than 5.8 mm
.... **14**

14a. Forehead with steep slope (Fig. 79)
.... **Keen's Long-eared Myotis** (*Myotis keenii*)[9]
14b. Forehead with a gradual slope (Fig. 80)
.... **Northern Long-eared Myotis** (*Myotis septentrionalis*)[9]

15a. Forehead with steep slope (Fig. 79)
.... **California Myotis** (*Myotis californicus*)
15b. Forehead with a gradual slope (Fig. 80)
.... **Western Small-footed Myotis** (*Myotis ciliolabrum*)

C. HARES, RABBITS, AND PIKAS (LAGOMORPHA)

Important cranial traits for identifying species in this order include the fenestration of the rostrum, the supraorbital processes, distinctness of the interparietal bone, and cranial size (Fig. 81). Basilar length and maxillary toothrow length are used as measures for skull size. Although basilar length is a good index of skull size, it cannot be taken on broken skulls and may be influenced by age. Maxillary toothrow length can be usually taken from broken skulls and it is less affected by age variation than basilar length.

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[9] Because their measurements overlap to some extent, distinguishing the long-eared myotis bat species from single cranial measurements is difficult. Their skulls should be submitted to a natural history museum for verification.

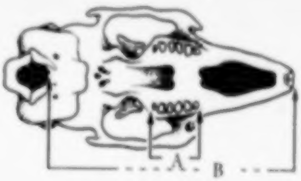

FIGURE 81. LAGOMORPH SKULL MEASUREMENTS.
A: MAXILLARY TOOTHROW LENGTH. B: BASILAR LENGTH

1a. Skull lacking supraorbital processes (Fig. 82),
rostrum with single oval fenestration (Fig.83)
.... **Collared Pika** (*Ochotona collaris*)[10]
OR **American Pika** (*Ochotona princeps*)

1b. Skull with supraorbital processes (Fig. 84),
rostrum with lattice like fenestration (Fig. 85) 2

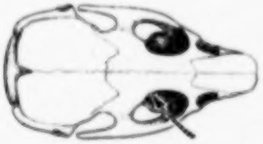

FIGURE 82

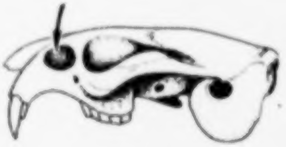

FIGURE 83

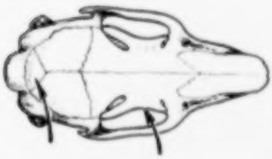

FIGURE 84

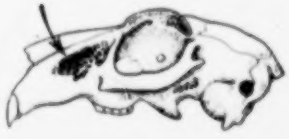

FIGURE 85

2a. Interparietal bone indistinct, fused to parietal bones (Fig. 86)
supraorbital processes broad and wing-like 3

2b. Interparietal bone distinct, not fused to parietal bones (Fig. 84)
supraorbital bone narrow and strap-like 4

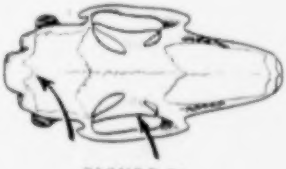

FIGURE 86

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[10] Although they differ in pelage colour, The Collared Pika (*Ochotona collaris*) and American Pika (*Ochotona princeps*) can not be discriminated by any single skull measurement. Nevertheless, the two species in British Columbia are separated in their ranges by a hiatus of some 800 km.

3a. Basilar length greater than 69.0 mm, maxillary toothrow greater than 16.0 mm .... **White-tailed Jackrabbit** (*Lepus townsendii*)

3b. Basilar length less than 69.0 mm, maxillary toothrow length less than16.0m .... **Snowshoe Hare** (*Lepus americanus*

4a. Tip of posterior extension of supraorbital process free of the braincase .... **European Rabbit** (*Oryctolagus cuniculus*)

4b. Tip of posterior extension of supraorbital process touching the braincase 5

5a. Basilar length greater than 57.0 mm, maxillary toothrow length greater than 14.0 mm .... **Eastern Cottontail** (*Sylvilagus floridanus*)

5b. Basilar length less than 57.0 mm, maxillary toothrow length less than 14.0 mm .... **Nuttall's Cottontail** (*Sylvilagus nuttallii*)

D. RODENTS (RODENTIA)

Important cranial traits for identifying rodents include: size (skull length, maxillary toothrow length) (Fig. 87); the morphology of the crowns of the molar teeth (Fig. 88); and the size, shape and position of the infraorbital opening (Figs. 89, 90). It may not be possible to use size to identify immature animals where the skull is not completely developed. The cusp patterns that distinguish the Old World murine rodents (rats) and the New World sigmodontine rodents (deer mice) are not discernible in old animals with worn teeth. However, enamel patterns on the molar teeth of most arvicoline rodents (voles, lemmings), are not affected by tooth wear.

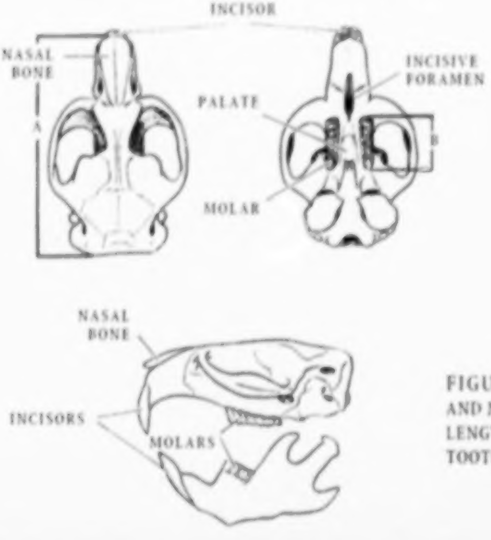

FIGURE 87. RODENT SKULL AND MEASUREMENTS. **A:** SKULL LENGTH. **B:** MAXILLARY TOOTHROW LENGTH

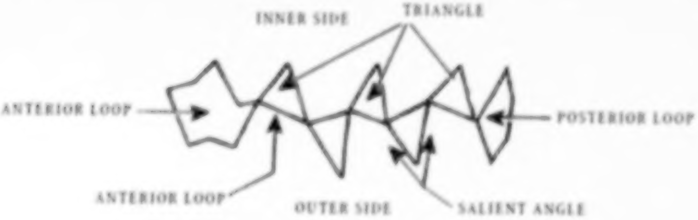
INNER SIDE
TRIANGLE
ANTERIOR LOOP
POSTERIOR LOOP
ANTERIOR LOOP
OUTER SIDE
SALIENT ANGLE

FIGURE 88. NOMENCLATURE OF A MANDIBULAR MOLAR OF AN ARVICOLINE RODENT.

1a. Skull with large and conspicuous infraorbital opening (Fig. 89) 2
1b. Skull with small and inconspicuous infraorbital opening (Fig. 90) 25

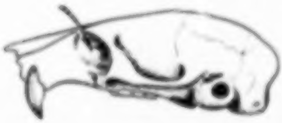

FIGURE 89

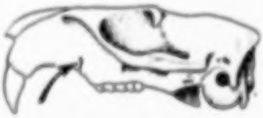

FIGURE 90

2a. Infraorbital opening on the side of the rostrum (Fig. 91)
.... **Great Basin Pocket Mouse** (*Perognathus parvus*)
2b. Infraorbital opening not on side of rostrum 3

3a. Infraorbital opening exceeding the foramen magnum in size,
round in outline .... **Porcupine** (*Erethizon dorsatum*)
3b. Infraorbital opening not exceeding the foramen magnum in size,
oval or V-shaped in outline. 4

4a. Infraorbital opening oval in outline (Fig. 89) 5
4b. Infraorbital opening V-shaped in outline (Fig. 92) 7

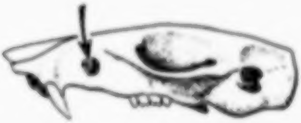

FIGURE 91

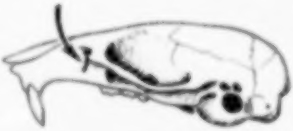

FIGURE 92

5a. First upper cheektooth (i.e., premolar) with a distinct crescent fold at the base of the main cusp (Fig. 93) .... **Pacific Jumping Mouse** (*Zapus trinotatus*)[11]

5b. First upper cheektooth (i.e., premolar) without a distinct crescent fold at the base of the main cusp (Fig. 94) 6

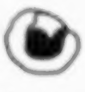

FIGURE 93

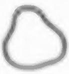

FIGURE 94

6a. Incisive foramen length (Fig. 95) less than 4.2 mm, maxillary toothrow length less than 3.7 mm .... **Meadow Jumping Mouse** (*Zapus hudsonius*)

6b. Incisive foramen length (Fig. 95) greater than 4.2 mm, maxillary toothrow length greater than 3.7 mm .... **Western Jumping Mouse** (*Zapus princeps*)

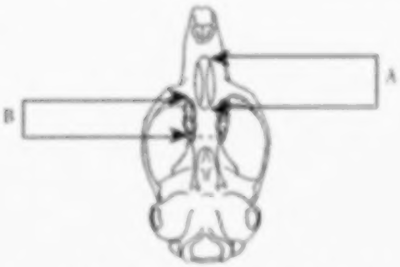

FIGURE 95 A. INCISIVE FORAMEN LENGTH
B. MAXILLARY TOOTHROW LENGTH

7a. Crowns of molars with triangles or prisms of dentine surrounded by enamel (Figs. 96, 97) 8

7b. Crowns of molars with cusps and lacking triangles or prisms (Fig. 98) 21

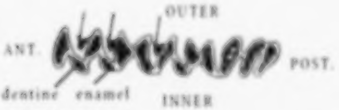

FIGURE 96

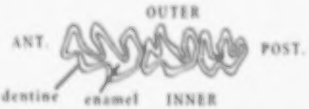

FIGURE 97

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[11] This trait tends to variable and it is not discernible in animals with worn teeth. For animals taken from areas of the Cascade Mountains where this species overlaps with the range of the Western Jumping Mouse (*Zapus princeps*) skulls should be submitted to a museum for verification.

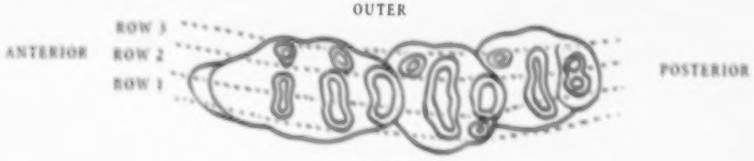

FIGURE 98

8a. Zygomatic plate extending anteriorly from zygomatic process of maxilla (Fig. 99), molars with prisms not arranged in alternating triangles (Fig. 97) .... **Bushy-tailed Woodrat** (*Neotoma cinerea*)

8b. Zygomatic plate not extending anteriorly from zygomatic process of maxilla (Fig. 100), molars with prisms arranged in alternating triangles (Fig. 96) 9

9a. Length of maxillary toothrow greater than 14.0 mm .... **Muskrat** (*Ondatra zibethicus*)

9b. Length of maxillary toothrow less than 14.0 mm 10

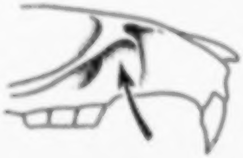

FIGURE 99

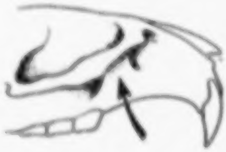

FIGURE 100

10a. Re-entrant angles deeper on outer side of upper molars, 1st and 2nd molar re-entrant angles extend to inner border of tooth (Fig. 96) 11

10b. Re-entrant angles not deeper on outer side of upper molars, 1st and 2nd molar re-entrant angles do not extend to inner border of tooth (Fig. 101) 12

11a. Mandibular molars lacking closed triangles on the outer sides (Fig. 102) .... **Northern Bog Lemming** (*Synaptomys borealis*)

11b. Mandibular molars with closed triangles on the outer sides (Fig. 103) .... **Brown Lemming** (*Lemmus trimucronatus*)

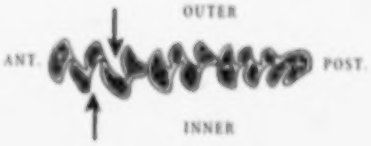

FIGURE 101

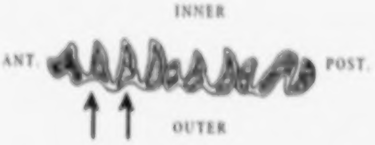

FIGURE 102

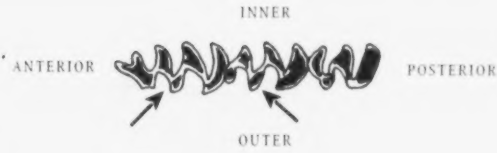

FIGURE 103

12a. On mandibular molars, inner re-entrant angles deeper than outer re-entrant angles (Fig. 104) .... **Heather Vole** (*Phenacomys intermedius*)

12b. On mandibular molars, inner and outer re-entrant angles about equal in depth (Fig. 105) 13

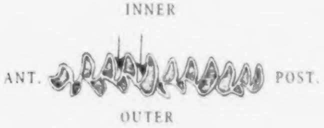

FIGURE 104

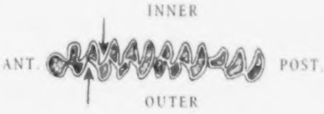

FIGURE 105

13a. Bony palate terminates as a thin transverse shelf extending between the last molars (Fig. 106) 14

13b. Bony palate terminates as a sloping median ridge between the last molars bordered by lateral pits (Fig. 107) 15

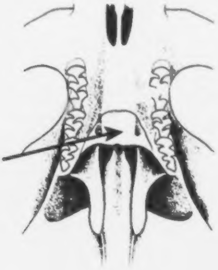

FIGURE 106

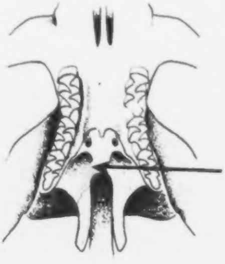

FIGURE 107

14a. Posterior edge of the palate usually completely fused (Fig. 108) .... **Southern Red-backed Vole** (*Clethrionomys gapperi*)[12]

14b. Posterior edge of the palate usually incompletely fused (Fig. 109) .... **Northern Red-backed Vole** (*Clethrionomys rutilus*)[12]

[12] Development of the palate is related to growth and age. Some old Northern Red-backed Voles (*Clethrionomys rutilus*) may have palates with their posterior edge completely fused and a few immature Southern Red-backed Voles (*Clethrionomys gapperi*) may have palates with their posterior edge incompletely fused. Skulls taken from areas of overlap among the two species should be examined by an expert at a natural history museum.

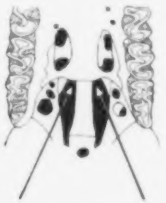

FIGURE 108

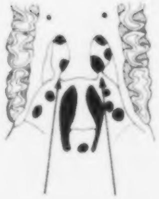

FIGURE 109

15a. Second upper molar with 3 closed triangles and a round posterior loop (Fig. 110) .... **Meadow Vole** (*Microtus pennsylvanicus*)

15b. Second upper molar with 3 closed triangles but lacking a posterior loop (Fig. 111) **16**

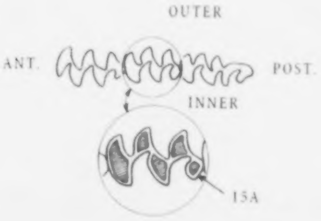
OUTER
ANT.
POST.
INNER
15A

FIGURE 110

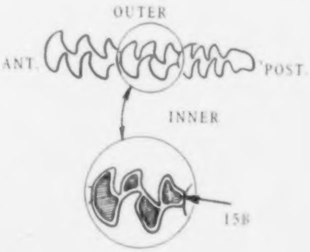
OUTER
ANT.
POST.
INNER
15B

FIGURE 111

16a. First mandibular molar usually with 4 closed triangles (Fig. 112) .... **Tundra Vole** (*Microtus oeconomus*)

16b. First mandibular molar with 5 or 6 closed triangles (Fig. 113) **17**

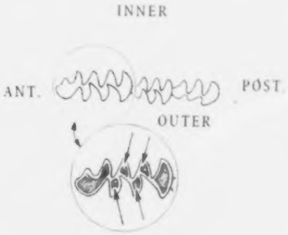
INNER
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FIGURE 112

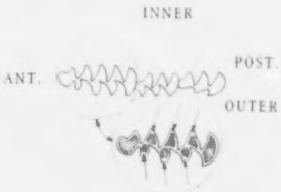

INNER
ANT.
POST.
OUTER

FIGURE 113

17a. Third upper molar with 3 inner salient angles (Fig. 114)
.... **Creeping Vole** (*Microtus oregoni*)

17b. Third upper molar with 4 inner salient angles (Fig. 115) 18

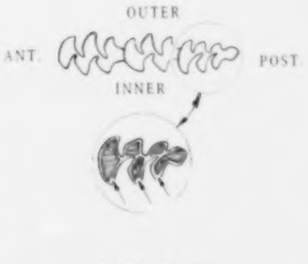


FIGURE 114

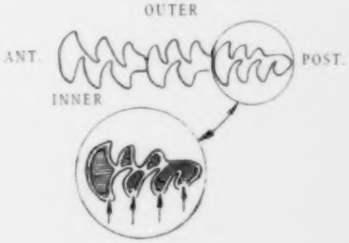


FIGURE 115

18a. When skull viewed dorsally, upper incisors protrude extensively beyond the nasal bones (Fig. 116); incisive foramina taper to narrow slits posteriorly (Fig. 117)
.... **Water Vole** (*Microtus richardsoni*)

18b. When skull viewed dorsally, upper incisors hidden or protrude only slightly beyond the nasal bones (Fig. 118, 119); incisive foramina not tapered to narrow slits posteriorly (Figs. 120, 121)....... 19

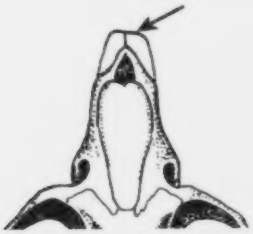


FIGURE 116

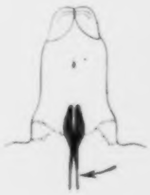


FIGURE 117

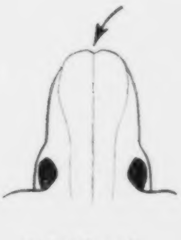


FIGURE 118

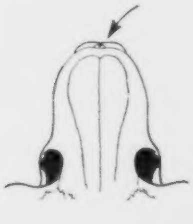


FIGURE 119

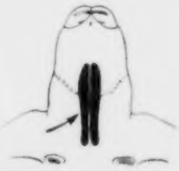


FIGURE 120

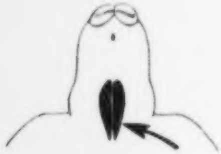


FIGURE 121

19a. When skull viewed dorsally, upper incisors hidden by the nasal bones (Fig. 118) .... **Long-tailed Vole** (*Microtus longicaudus*)[13]
19b. When skull viewed dorsally, upper incisors extend slightly beyond the nasal bones (Fig. 119) **20**

20 a. Incisive foramina taper gradually in the posterior region (Fig. 120) .... **Townsend's Vole** (*Microtus townsendii*)[13]
20b. Incisive foramina taper sharply in the posterior region (fig. 121) .... **Montane Vole** (*Microtus montanus*)[13]

21a. Cusps of first 2 upper molars arranged in 3 longitudinal rows (Fig. 122)........ **22**
21b. Cusps of first 2 upper molars arranged in 2 longitudinal rows (Fig. 123)........ 24

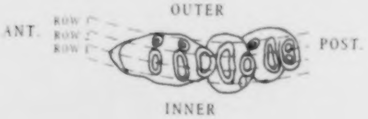


FIGURE 122

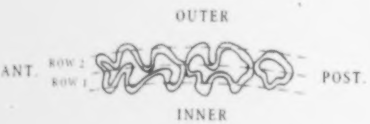
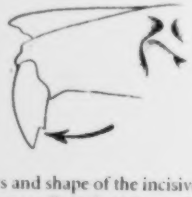


FIGURE 123

22a. Upper incisor notched in side view (Fig. 124), maxillary toothrow length less than 6.0 mm, greatest length of skull less than 25 .... **House Mouse** (*Mus musculus*)
22b. Upper incisor not notched in side view, maxillary toothrow length greater than 6.0 mm, greatest length of skull greater than 25.0 mm **23**

FIGURE 124



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[13] Because the protrusion of the incisors and shape of the incisive foramina vary with age, these traits are not completely reliable. Townsend's Vole (*Microtus townsendii*) and the Montane Vole (*Microtus montanus*) are widely separated in their ranges in British Columbia. However, the Long-tailed Vole (*Microtus longicaudus*) co-occurs with *M. townsendii* in the lower Fraser River valley and co-occurs with *M. montanus* in the interior grasslands. Discriminating the skulls of these voles from these regions is difficult and identifications should be verified by an expert at a natural history museum.

23a. Braincase rectangular, temporal ridges straight and nearly parallel (Fig. 125) .... **Norway Rat** (*Rattus norvegicus*)

23b. Braincase rounded, temporal ridges curved (Fig. 126) .... **Black Rat** (*Rattus rattus*)

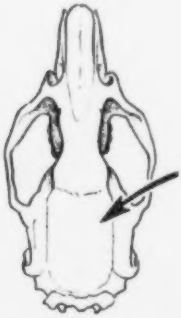

FIGURE 125

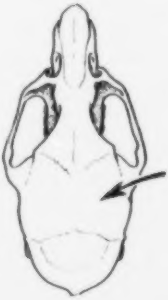

FIGURE 126

24a. Upper incisor with a distinct groove on anterior face (Fig. 127), maxillary toothrow length less than 3.8 mm, skull length less than 23.0 mm .... **Western Harvest Mouse** (*Reithrodontomys megalotis*)

24b. Upper incisors without a groove on anterior face (Fig. 128), maxillary toothrow length greater than 3.8 mm, skull length greater than 23.0 mm .... **Keen's Mouse** (*Peromyscus keeni*) OR **Deer Mouse** (*Peromyscus maniculatus*)[14]

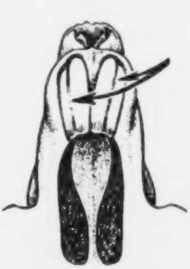

FIGURE 127

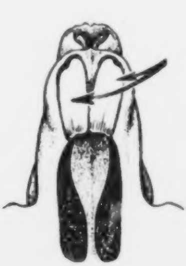

FIGURE 128

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[14] Keens' Mouse (*Peromyscus keeni*) and the Deer Mouse (*Peromyscus maniculatus*) can not be discriminated by any single cranial measurement. For animals captured from coastal areas where the two species co-occur voucher specimens should be submitted to a natural history museum for verification.

25a. Upper cheek-teeth with a distinct projection on outer side, auditory bullae flask shaped (Fig. 129) .... **Mountain Beaver** (*Aplodontia rufa*)
25b. Upper cheekteeth lacking a distinct projection on outer side, auditory bullae not flask shaped 26

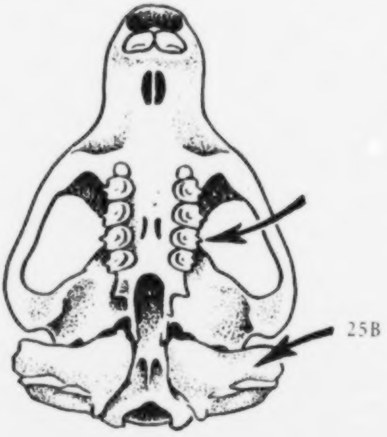

FIGURE 129

26a. Upper and lower premolars indented on the side forming an "8" shape (Fig. 130) .... **Northern Pocket Gopher** (*Thomomys talpoides*)
26b. Upper and lower premolars not "8" shaped 27

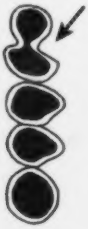

FIGURE 130

27a. Prominent depression in basioccipital region (Fig. 131),
width of first upper cheek tooth greater than 9.5 mm
.... **Beaver** (*Castor canadensis*)

27b. No prominent depression in basioccipital region,
width of first upper cheek tooth less than 9.5 mm 28

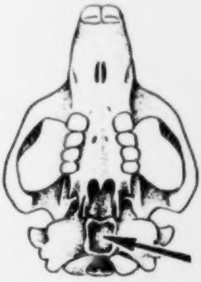

FIGURE 131

28a. Dorsal profile of skull straight (Fig. 132),
interorbital region with a shallow depression,
postorbital processes at right angles to main axis of skull (Fig. 133) 29

28b. Dorsal profile of skull convex (Fig. 134),
no shallow depression in interorbital region,
postorbital processes directed obliquely backwards (Fig. 135) 32

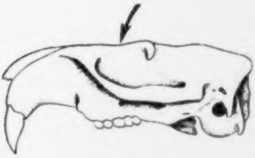

FIGURE 132

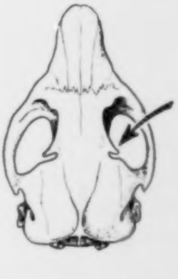

FIGURE 135

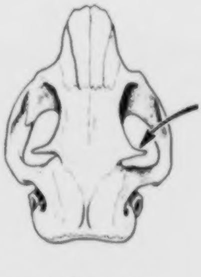

FIGURE 133

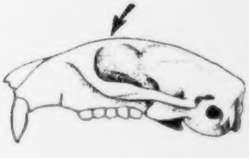

FIGURE 134

29a. Length of maxillary toothrow greater than 21.2 mm **30**
29b. Length of maxillary toothrow less than 21.2 mm **31**

30a. Posterior border of nasal bones forms a V-shaped notch (Fig. 136)
.... **Vancouver Island Marmot** (*Marmota vancouverensis*)
30b. Posterior border of nasal bones square or arched (Fig. 137)
.... **Hoary Marmot** (*Marmota caligata*)

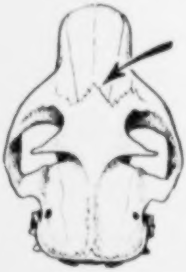

FIGURE 136

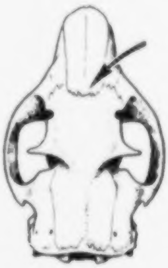

FIGURE 137

31a. Upper toothrows parallel, posterior border of nasal bones forms a V-shaped notch (Fig. 136) .... **Woodchuck** (*Marmota monax*)
31b. Upper toothrows diverge anteriorly, posterior border of nasal bones forms an arch (Fig. 137) .... **Yellow-bellied Marmot** (*Marmota flaviventris*)

32a. Infraorbital opening simple and rounded piercing the zygomatic plate (Fig. 138), skull length less than 40.0 mm, maxillary toothrow length less than 7.0 mm **33**
32b. Infraorbital opening modified as a canal that passes between the zygomatic plate and the side of rostrum (Fig. 139), skull length greater than 40.0 mm, maxillary toothrow length greater than 7.0 mm **35**

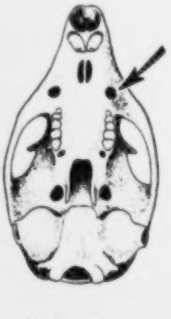

FIGURE 138

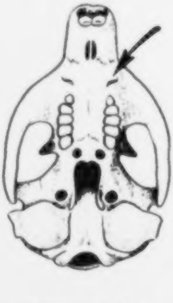

FIGURE 139

33a. Skull length greater than 37.0 mm,
maxillary toothrow length greater than 6.0 mm
.... **Townsend's Chipmunk** (*Tamias townsendii*)
33b. Skull length less than 37.0 mm,
maxillary toothrow length less than 6.0 mm 34

34a. Skull length usually less than 32.5 mm,
mandibular length less than 17.5 mm..... **Least Chipmunk** (*Tamias minimus*)[15]
34b. Skull length usually greater than 32.5 mm,
mandibular length greater than 17.5 mm
.... **Red-tailed Chipmunk** (*Tamias ruficaudus*)[16]
OR **Yellow-pine Chipmunk** (*Tamias amoenus*)[16]

35a. Zygomatic arches converge anteriorly and flattened in a horizontal plane
(Fig. 140) 36
35b. Zygomatic arches parallel, not flattened in a horizontal plane (Fig. 141) 37

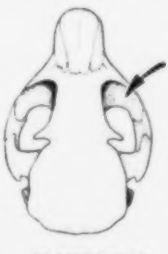
FIGURE 140

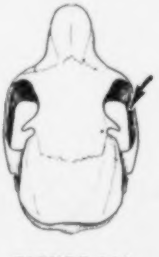
FIGURE 141

36a. Skull length greater than 49.0 mm, maxillary toothrow greater than 10.0 mm
.... **Arctic Ground Squirrel** (*Spermophilus parryii*)[17]
OR **Columbian Ground Squirrel** (*Spermophilus columbianus*)[17]
36b. Skull length less than 49.0 mm, maxillary toothrow less than 10.0 mm
.... **Cascade Mantled Ground Squirrel** (*Spermophilus saturatus*)[18]
OR **Golden-mantled Ground Squirrel** (*Spermophilus lateralis*)[18]

[15] These diagnostic measurements will discriminate most Least Chipmunks (*Tamias minimus*) from the Rocky Mountains and Columbia Mountains of southern British Columbia. However, in northern areas of the province where this species is larger and co-occurs with the Yellow-pine Chipmunk (*Tamias amoenus*), the two species can only be positively identified from genital bone morphology.

[16] In southeastern British Columbia where the Red-tailed Chipmunk (*Tamias ruficaudus*) and Yellow-pine Chipmunk (*Tamias amoenus*) co-occur, the two species overlap in size and they can not be distinguished from any single skull measurement. Positive identification is based on genital bone morphology or examination of skins and skulls by a natural history museum.

[17] Although they show minor differences in their pelage, skulls of the Columbian Ground Squirrel (*Spermophilus columbianus*) and Arctic ground Squirrel (*Spermophilus parryii*) can not be discriminated by any single measurement. However, distributions of the two species in British Columbia are widely separate.

[18] Although they differ in their pelage colour and stripes, skulls of the Golden-mantled Ground Squirrel (*Spermophilus lateralis*) and Cascade Mantled Ground Squirrel (*Spermophilus saturatus*) can not be discriminated by any single measurement. However, distributions of the two species in British Columbia are separate.

37a. Interorbital region indented with a V-shaped notch (Fig. 142)
.... **Northern Flying Squirrel** (*Glaucomys sabrinus*)
37b. Interorbital region not indented with a V-shaped notch 38

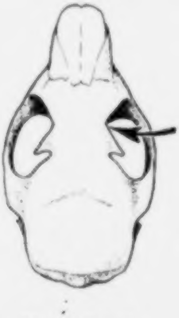

FIGURE 142

38a. Skull length greater than 55.0 mm, maxillary toothrow greater than 10.0 mm, anterior ventral border of orbit opposite the first upper molar (Fig. 143) 39
38b. Skull length less than 55.0 mm, maxillary toothrow less than 10.0 mm, anterior ventral border of orbit opposite the second upper premolar (Fig. 144)
.... **Red Squirrel** (*Tamiasciurus hudsonicus*)[19]
OR **Douglas Squirrel** (*Tamiasciurus douglasii*)[19]

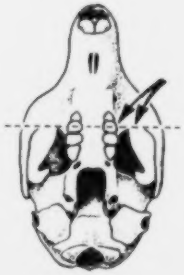

FIGURE 143

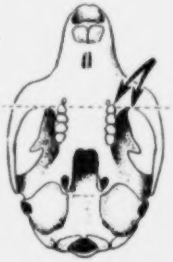

FIGURE 144

39a. Two upper premolars
.... **Eastern Gray Squirrel** (*Sciurus carolinensis*)
39b. One upper premolar
.... **Fox Squirrel** (*Sciurus carolinensis*)

[19] Although these species generally differ in ventral pelage colour, their skulls can not be discriminated from any single measurement. Specimens taken from areas on the eastern slopes of the Cascade and Coast Mountains where the two species co-occur should be submitted to a natural history museum for verification.

Key To Chipmunk Genital Bones

Because species convergence in pelage colour and size, chipmunks are difficult or impossible to identify from pelage or even skull morphology in areas of the province where two or more species co-occur. An important diagnostic trait for discriminating chipmunk species is the morphology of the male and female genital bones i.e., baculum and baubellum (White 1953; Sutton 1982). Imbedded in the genitalia, these structures have to be specially prepared by clearing the surrounding tissue with potassium hydroxide and staining with Alazarin red, a stain that turns bone deep red. Preparation techniques are given in White (1951) and Sutton (1982). Because they are minute, the genital bones have to be viewed with a microscope and measured with an ocular micrometer.

A. MALE GENITAL BONE (BACULUM)

1a. Shaft length (Fig. 145) greater than 3.20 mm,
keel height greater (Fig. 145) than 0.45 mm
.... **Red-tailed Chipmunk** (*Tamias ruficaudus*)
1b. Shaft length less than 3.20 mm, keel height less than 0.45 mm 2

2a. Ratio of the tip length to shaft length (Fig. 145) greater than 30% 3
2b. Ratio of the tip length to shaft length less than 30%
.... **Least Chipmunk** (*Tamias minimus*)

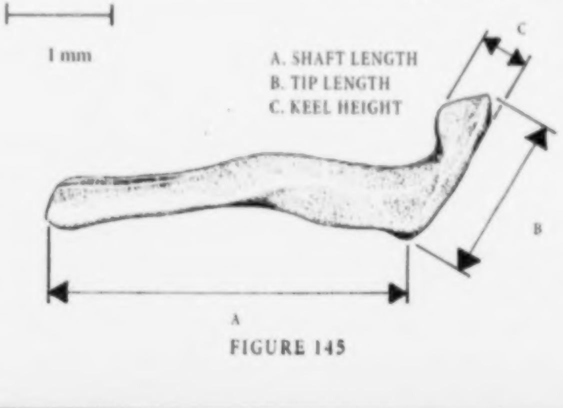

FIGURE 145

3a. Tip length (Fig. 145) greater than 1.0 mm
.... **Townsend's Chipmunk** (*Tamias townsendii*)

3b. Tip length less than 1.0 mm
.... **Yellow-pine Chipmunk** (*Tamias amoenus*)

B.FEMALE GENITAL BONE (BAUBELLUM)

1a. Greatest length (Fig. 146) greater than 2.0 mm, tip height (Fig. 146) greater than 0.40 mm
.... **Red-tailed Chipmunk** (*Tamias ruficaudus*)

1b. Greatest length less than 2.0 mm, tip height less than 0.40 mm 2

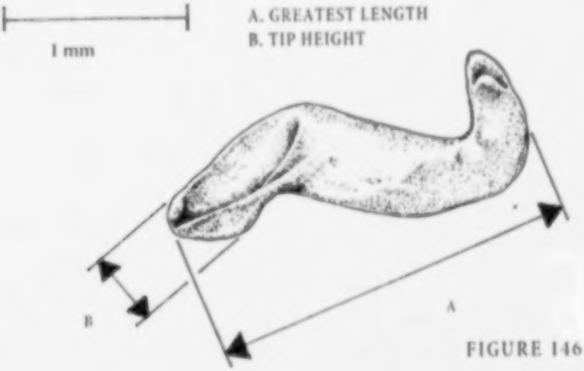

FIGURE 146

2a. Base "U" shaped base and usually tapered sharply near the proximal end (Fig. 147) .... **Townsend's Chipmunk** (*Tamias townsendii*)
OR **Least Chipmunk** (***Tamias minimus***)[20]

2b. Base not "U" shaped and usually not tapered sharply near the proximal end (Fig. 148) .... **Yellow-pine Chipmunk** (*Tamias amoenus*)

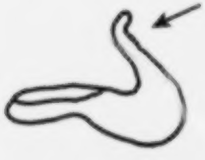

FIGURE 147

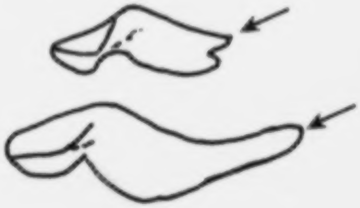

FIGURE 148

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[20] Baubella of Least Chipmunk (*Tamias minimus*) and Townsend's Chipmunk (*Tamias townsendii*) overlap in all measurements and are similar in general shape. However, the two chipmunks are widely separated in their range in British Columbia and are easily discriminated by skull size and pelage colour.

Species Accounts

A detailed species account is provided for each of the 83 species covered in the identification keys. Species accounts follow the arrangement in the checklist. Information in the species accounts is summarised under three headings: **Description**, **Similar Species**, and **Range**.

Description is a concise description of the mammal including body measurements, weight, and the dental formula. Descriptions of fur colour, body measurements, and weights are based on adult museum specimens and live animals from British Columbia. Exceptions were rare species known from only a few specimens or captures from the province. For those species, descriptions and measurements were based on museum specimens collected from adjacent regions of western North America and the source of their measurements and weights is noted in the account.

All linear body measurements (Fig. 7) are in millimetres. Weight (WT) is in the nearest 0.1 grams (g) for animals weighing less than 1,000 grams and in nearest 0.01 kilograms (kg) for animals weighing more than 1,000 grams. Standard mammalian measurements given include total length (TL), tail vertebrae length (TV), hind foot length (HF), and ear length (E). Body length (total length minus tail vertebrae length) is given in some comparisons of similar species. For bats, the forearm length (FA) and tragus length (TR) is also included. The values given are the mean, range (in parentheses), and sample size (number of individuals measured). For example, the mean total length of the Snowshoe Hare is 443 mm, based on measurements obtained from 139 animals with total lengths ranging from 388 to 530 mm—these figures are written as "443 (388–530) n= 139". Because weight varies with season and reproductive condition, the reader should be aware that there is considerable variation associated with the mean for each species. For species with marked sexual dimorphism, separate weights are given for males and females.

The dental formula describes the number of teeth in one side of the head (see Figures 51, 70 and 87). The first number is the number in the upper jaw; the second figure is the number in the lower jaw. For example, incisors 3/3, canines 1/1, premolars 4/4, molars 3/3 for the Coast Mole (*Scapanus orarius*) indicates three upper and lower incisors, one upper and lower canine, four upper and lower premolars, and three upper and lower molars. The dental formula for shrews includes the number of unicuspids. Which of the unicuspid teeth are incisors, canines, and premolars is unknown.

Similar Species is a comparison with species that may be confused in identification. Skull measurements used in comparisons are defined in Figures 52, 71, 81, and 87.

Range is a description of the provincial range. It includes a generalized range map. The maps are not precise range maps and are only intended to assist the reader with determining the species that may be present in a study area. Provincial range maps showing dots for individual records are given in Nagorsen and Brigham (1993) for bats and in Nagorsen (1996) for insectivores.

ORDER DIDELPHIMORPHIA: NEW WORLD OPOSSUMS

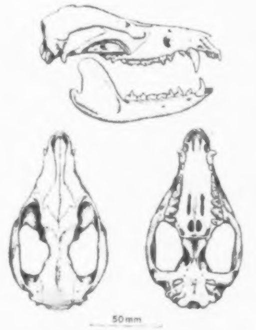
FAMILY DIDELPHIDAE: OPOSSUMS

Didelphis virginiana
(North American Opossum)

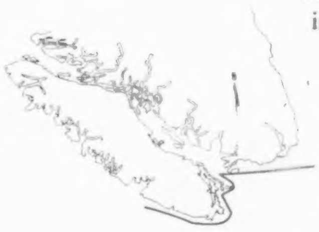
DESCRIPTION: superficially appears cat-like with a long pointed snout, naked black ears with white or pink tips. The prehensile scaly tail is furred at the base. The fur is coarse with long guard hairs and woolly underfur. Dorsal pelage ranges from grey to white. A black colour phase with black-tipped guard hairs occurs in some populations. Females have a pouch (i.e., marsupium); the hind foot has an opposable thumb (Fig. 1). The skull has 50 teeth including five pairs of upper incisors.

External measurements: TL=753 (635–859) n=142, TV= 286 (246–358) n=141, HF= 65 (57–78) n=142, E= 55 (47–62) n=102, WT= 2.7 kg (1.5–4.1) n=54 males, 2.1 kg (1.5–2.9) n=80 females.

Dental Formula: incisors 5/4, canines 1/1, premolars 3/3, molars 4/4.



SIMILAR SPECIES: resembles no other British Columbian mammal in external appearance. The skull can be readily identified by 10 upper incisors and a total of 50 teeth.



RANGE: introduced into Oregon and Washington and naturally spread into the lower Fraser River valley where it occurs as far east as Spuzzum. A population was recently introduced to Hornby Island and there are a few recent records from the Victoria area on Vancouver Island.

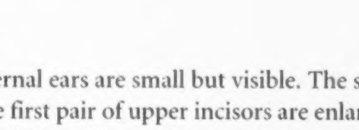
ORDER INSECTIVORA: INSECTIVORES

Small mammals with long narrow snouts that extend well beyond the mouth, short fur, small ears, minute eyes, and five digits on the front and hind feet. The skull has a low braincase, long rostrum, teeth with numerous sharp cusps, and canine teeth that are no larger than the incisors.

FAMILY SORICIDAE: SHREWS

Front feet are not enlarged; the external ears are small but visible. The skull lacks zygomatic arches (Fig. 55), the first pair of upper incisors are enlarged with a prominent hook (Fig. 56), and the teeth are pigmented with red.

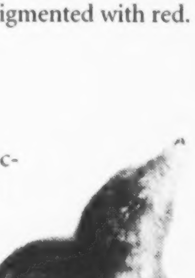
Sorex arcticus
(Black-backed Shrew)



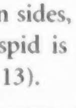
DESCRIPTION: a medium-sized shrew with distinctive tricoloured fur characterised by a blackish dorsal band, brown sides, and greyish-brown belly. The third unicuspid is greater or equal in size to fourth (Fig. 13).

External measurements: TL= 116 (100–125) n=30, TV= 41 (36–46) n=32, HF= 14 (12–19) n=31, E= 7 (5–9) n=8, WT= 9.4 g (6.0–13.0) n=10.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.



SIMILAR SPECIES: although its range does not overlap with *S. arcticus*, the Tundra Shrew (*Sorex tundrensis*) is our only shrew of comparable size that has similar markings and unicuspid teeth. *S. tundrensis* has a brown dorsal stripe, shorter tail (<36 mm), and smaller skull (skull length <18.5 mm, palatal length <8.2 mm).



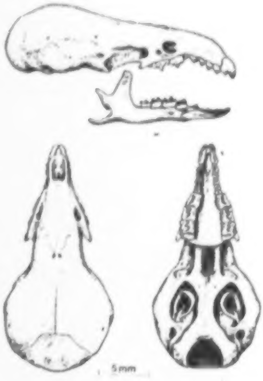
RANGE: east of the Rocky Mountains in northeastern British Columbia from the Peace River to the Fort Nelson region.

Sorex bendirii
(Pacific Water Shrew)

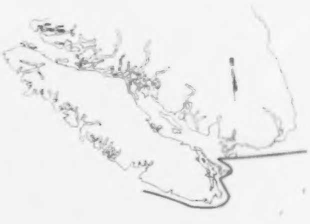
DESCRIPTION: the largest shrew in the province, it has a dorsal pelage that ranges from dark brown to black. The undersides are dark brown. The tail is unicoloured - dark brown. The hind feet have a stiff fringe of hairs (Fig. 10). The third unicuspid is smaller in size than the fourth (Fig. 14); the rostrum of the skull is curved ventrally in side view (Fig. 62).

External measurements: TL= 154 (137–176) n=95, TV= 70 (61–81) n=94, HF= 19 (17–21) n=93, E= 8 (7–9) n=3, WT= 10.6 g (10.0–17.2) n=13.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

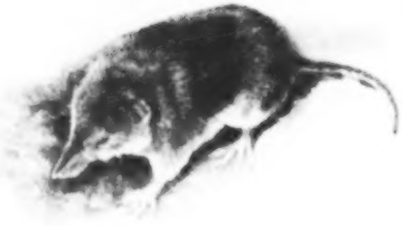


SIMILAR SPECIES: the large size (total length >130 mm; hind foot >18 mm; skull length >19.0 mm; palatal length >8.2 mm) and stiff fringe of hairs on the hind feet distinguish *S. bendirii* from all our other shrew species except for the Water Shrew (*Sorex palustris*). *S. palustris* can be identified by: grey to black dorsal fur with a silver-grey belly, a bicoloured tail that has a paler underside, and a skull with the rostrum not curved ventrally (Fig. 63).



RANGE: restricted to the lower Fraser River valley where it ranges east to Cultus Lake. Northernmost records are from low elevations on the north shore of Vancouver (e.g., Mount Seymour Provincial Park). There is an unconfirmed record from Harrison Lake.

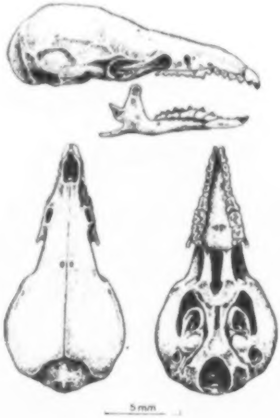
Sorex cinereus (Common Shrew)



DESCRIPTION: a small shrew with brown to dark brown dorsal pelage that does not contrast sharply with the fur on the sides. The undersides are grey; the tail is bicoloured. The skull is small (skull length <17.0 mm, palatal length <7.2 mm); the third unicuspid is greater or equal to the fourth (Fig. 13).

External measurements: TL= 99 (76–119) n=137, TV= 42 (29–49) n=137, HF= 12 (9–14) n=139, E= 7(6–9) n=74, WT= 4.1 g (2.5–8.0) n=137.

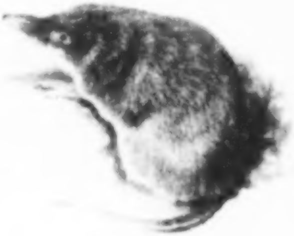
Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.



SIMILAR SPECIES: its range overlaps with four other British Columbian shrews that have the third unicuspid tooth larger than the fourth: Black-backed Shrew (*S. arcticus*), Merriam's Shrew (*Sorex merriami*), Preble's Shrew (*S. preblei*), and Tundra Shrew (*S. tundrensis*). *S. arcticus* and *S. tundrensis* are larger than *S. cinereus* (weight >5.0 g, skull length >18.5 mm, palatal length >7.7 mm) and have a distinct tricoloured pelage where the fur colour on the back contrasts sharply from the sides. *S. merriami* is easily identified by the lack of a medial tine on the upper incisors. *S. preblei* can only be discriminated by cranial and dental measurements (skull length <14.6 mm, length of mandible <6.5mm, length of mandibular toothrow <4.3 mm).

RANGE: inhabits the entire mainland and a few coastal islands but not found on Vancouver Island or the Queen Charlotte Islands.

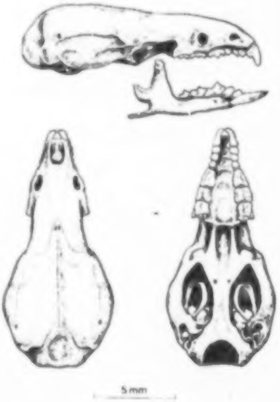
Sorex hoyi (Pygmy Shrew)



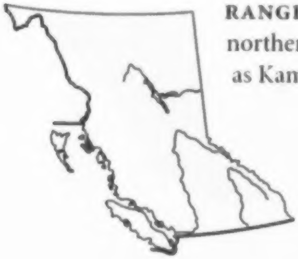
DESCRIPTION: one of the smallest shrews in British Columbia, it has dull greyish-brown pelage and a relatively short tail (<40% of total length). The teeth are darkly pigmented. There are five unicuspids but the tiny third and fifth unicuspids are hidden in side view (Fig. 12).

External measurements: TL= 82 (62–96) n=28, TV= 28 (22–33) n=27, HF= 10 (6–12) n=28, E= 6 (5–7) n=5, WT= 3.2 g (2.1–5.0) n=6.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

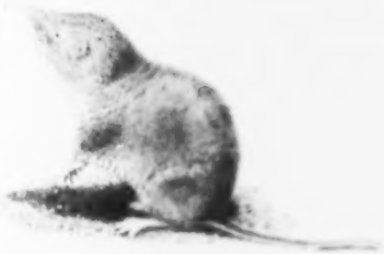


SIMILAR SPECIES: the presence of only three unicuspids when the skull is viewed laterally is diagnostic and distinguishes *S. hoyi* from all other British Columbian shrews. This species resembles the Common Shrew (*S. cinereus*) and Preble's Shrew (*S. preblei*) in its small size, but *S. hoyi* can be identified by its relatively shorter tail (<40% of total length) and dull greyish pelage.



RANGE: east of the coastal mountain ranges in northern and central British Columbia as far south as Kamloops and Kootenay National Park.

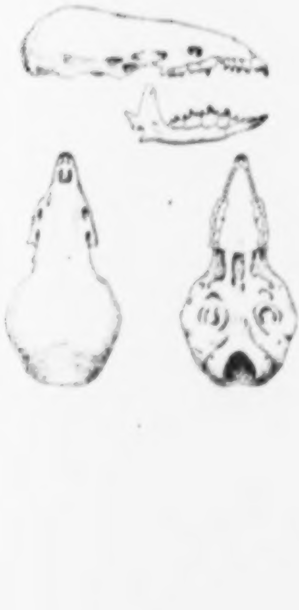
Sorex merriami
(Merriam's Shrew)



DESCRIPTION: a small shrew with a dorsal pelage that varies from grey to drab brown and pale nearly white undersides[21]. The tail is distinctly bicoloured. The teeth are heavily pigmented with the third unicuspid greater or equal to the fourth (Fig. 13) and the upper incisors lacking a medial tine (Fig. 15).

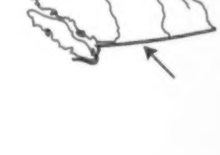
External measurements[22]: TL= 82–94 n=12, TV= 30–37 n=11, HF= 11–12 n=12, WT= 2.4–4.3 g n=11.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.



SIMILAR SPECIES: the lack of medial tines on the upper incisors is diagnostic and distinguishes *S. merriami* from all other British Columbian shrews.

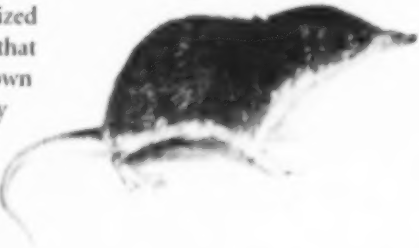
RANGE: known only from Kilpoola Lake in the southern Okanagan Valley but may be more widespread in the intermontane grasslands of the province.



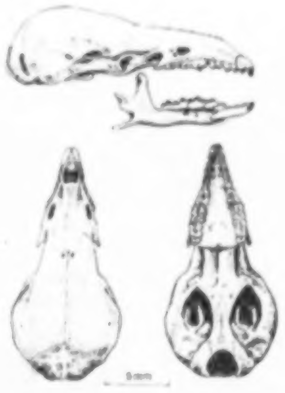
[21] Because no skins are available from British Columbia, the pelage description is based on descriptions of Merriam's Shrew (*Sorex merriami*) from the western United Sates.

[22] Only one decomposed specimen is available from British Columbia, measurements taken from Verts and Carraway (1998).

Sorex monticolus
(Dusky Shrew)



DESCRIPTION: a medium-sized shrew with a dorsal pelage that varies from greyish to dark brown in interior populations to nearly black in coastal populations. The undersides are brown to grey and the tail is not distinctly bicoloured. The toes (digits 2 to 5) have 5 or more pairs of toe pads per toe (Fig. 18). The third unicuspid is smaller than the fourth (Fig. 14), the medial edge of the first upper incisor appears straight in front view (Fig. 66), and the pigmented ridge on upper unicuspids is not separated from the cingulum by a longitudinal groove (Fig. 67).



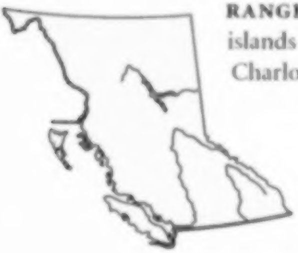
External measurements: TL= 117 (93–140) n=404, TV= 51 (35–68) n=436, HF= 14 (10–18) n=436, E= 7 (4–9) n=198, WT= 6.6 g (3.7–13.0) n=417.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

SIMILAR SPECIES: its range overlaps with four other British Columbian shrews that have the third unicuspid smaller than the fourth: Pacific Water Shrew (*S. bendirii*), Water Shrew (*S. palustris*), Trowbridge's Shrew (*S. trowbridgii*), and Vagrant Shrew (*S. vagrans*).

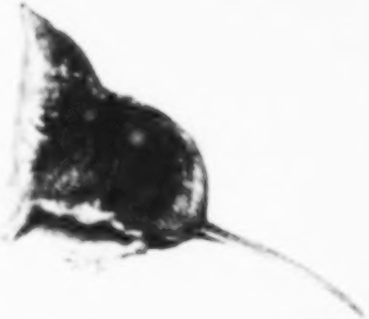
S. bendirii and *S. palustris* are readily identified by their pelage colour, a fringe of hairs on the hind feet, and large skulls (skull length >18.5 mm, palatal length >7.7 mm). *S. trowbridgii* has a distinctly bicoloured tail, its first upper incisors appear curved along the medial edge in front view (Fig. 66), and the pigmented ridge on the upper unicuspids is separated from the cingulum by a pronounced longitudinal groove (Fig. 65). These dental traits, however, may not be discernible in old animals with badly worn teeth.

Discriminating *S. monticolus* from *S. vagrans* is difficult for old animals with worn teeth and coastal populations where the pigmentation on the upper incisors is weak. Preliminary studies (van Zyll de Jong 1982; van Zyll de Jong 1984) suggest that *S. monticolus* has more than four pairs of toe pads (Fig. 18) on toes 2 to 5, but this has not been verified in a detailed study. *S. monticolus* can also be distinguished by having the medial tine on the first upper incisor positioned below the pigmented region (Fig. 19) and the width across the second upper molars (M^2-M^2) >4.5 mm (Fig. 52).

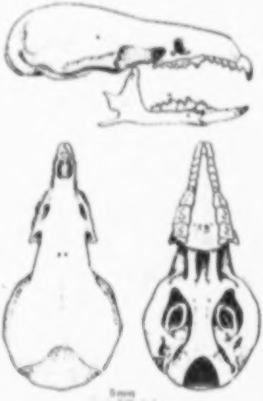


RANGE: the entire mainland and numerous coastal islands including Vancouver Island and the Queen Charlotte Islands.

Sorex palustris
(Common Water Shrew)



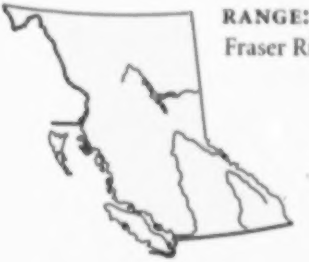
DESCRIPTION: a large shrew with an attractive dorsal pelage that is usually dark grey or black although some individuals appear dull brown. The ventral fur is silver-grey, sometimes washed with brown. The tail is distinctly bicoloured with dark above and white or grey on the undersides; the hind foot has a stiff fringe of hairs (Fig. 10). The third unicuspid is smaller than the fourth (Fig. 14); the rostrum of the skull is not curved ventrally (Fig. 63).



External measurements: TL= 152 (133–179) n=179, TV= 75 (62–88) n=177, HF= 20 (16–28) n=180, E= 7 (3–9) n=19, WT=10.6 g (7.5–16.4) n=17.

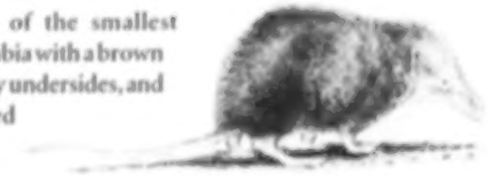
Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

SIMILAR SPECIES: our only similar shrew is the Pacific Water Shrew (*S. bendirii*); distributions of the two species overlap in a narrow zone in the north shore mountains (Mount Seymour) and the lower Fraser River valley (Cultus Lake). See the species account for *S. bendirii* for diagnostic traits.

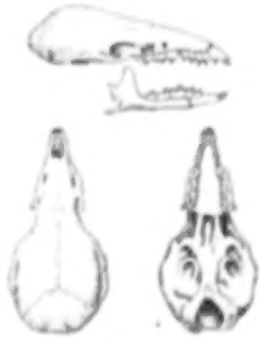


RANGE: the entire mainland (except for the lower Fraser River valley) and Vancouver Island.

Sorex preblei (Preble's Shrew)



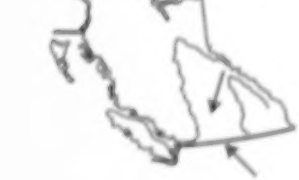
DESCRIPTION: one of the smallest shrews in British Columbia with a brown dorsal pelage, silver-grey undersides, and a distinctly bicoloured tail. The third unicuspid is greater or equal to the fourth (Fig. 13).



External measurements[11]: TL= 75 (71–77) n=3, TV= 32 (32–33) n=3, HF= 10 (9–11) n=3, E= 9 n=1, WT= 1.9–2.8 n=10.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

SIMILAR SPECIES: the only species *S. preblei* could be confused with are the Common Shrew (*S. cinereus*) and Pygmy Shrew (*S. hoyi*); see their accounts for diagnostic traits.



RANGE: known from the southern Okanagan Valley and the Nicola Valley but may be more widespread in the intermontane grasslands of the province.

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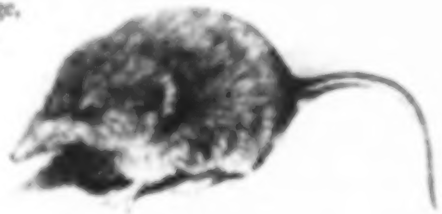
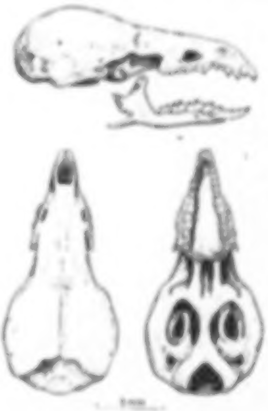
[11] Linear measurements from British Columbian specimens; weights taken from Verts and Carraway (1998).

Sorex trowbridgii (Trowbridge's Shrew)



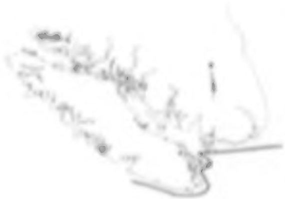
DESCRIPTION: a medium-sized shrew with dark grey dorsal pelage, and paler ventral fur. The tail is distinctly bicoloured with dark dorsal surface and white underneath. The third unicuspid is smaller than the fourth (Fig. 14), the medial edge of the first upper incisor appears curved in front view (Fig. 16), the pigmented ridge on the upper unicuspids is separated from the cingulum by a pronounced longitudinal groove (Fig. 65).



External measurements: TL= 118 (101–128) n=198, TV= 55 (41–62) n=198, HF= 13 (10–15) n=193, E= 7 (5–8) n=5, WT= 5.6 g (3.8–8.0) n=23.

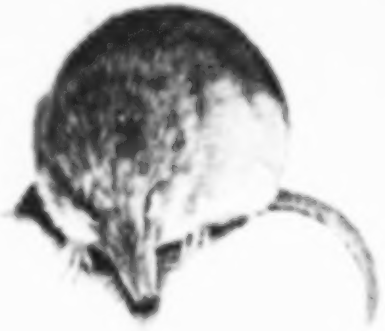
Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.

SIMILAR SPECIES: the grey pelage with distinctly bicoloured tail with white on its ventral surface is a diagnostic external trait. The skull resembles the Dusky Shrew (*S. monticolus*) and Vagrant Shrew (*S. vagrans*); see those species accounts for identification.



RANGE: restricted to the lower Fraser Valley where it ranges as far east as Chilliwack Lake and Boston Bar. Northern records are Vancouver and Harrison Lake.

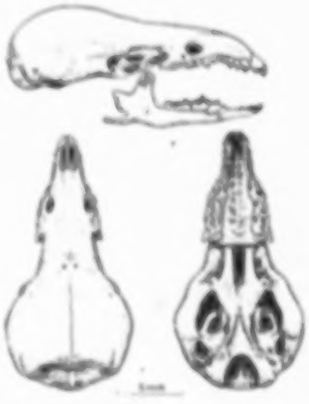
Sorex tundrensis (Tundra Shrew)



DESCRIPTION: a medium-sized shrew with a striking tricoloured pelage characterized by a brown dorsal stripe, greyish-pale brown sides, and a grey belly. The third unicuspid is greater or equal in size to the fourth (Fig. 13).

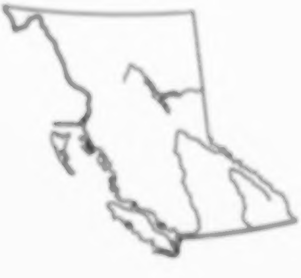
External measurements[24]: TL= 97 (84–115) n=31, TV= 31 (25-37) n=35, HF= 13 (10-15) n=34, E= 7 (4-7) n=12, WT=6.8 g (4.9-10.0) n=29.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.



SIMILAR SPECIES: although its range does not overlap with *S. tundrensis*, the Black-backed Shrew (*S. arcticus*) is our only species with similar markings and skull morphology. See its account for diagnostic traits.

RANGE: restricted to the Haines Triangle of extreme north-western British Columbia where it is known only from the Chilkat Pass and Kelsall Lake along the Haines Road.



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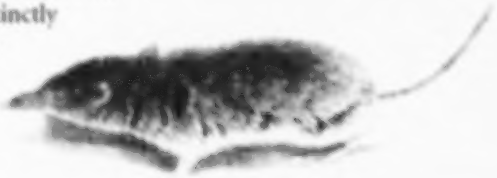
[24] Includes specimens from the Yukon Territory and western Northwest Territories.

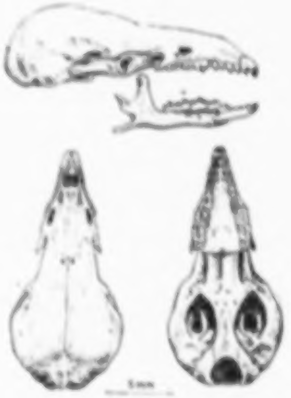
Sorex vagrans (Vagrant Shrew)

DESCRIPTION: a medium-sized shrew with a dorsal pelage that varies from greyish in interior populations to dark brown or nearly black in coastal populations. The undersides are brown to grey; the tail is not distinctly bicoloured. There are four or less pairs of toe pads on each toe [digits 2 to 5 (Fig. 20)]. The third unicuspid is smaller than fourth (Fig. 14), the medial edge of the first upper incisor appears straight in front view (Fig. 17), and the pigmented ridge on the upper unicuspids is not separated from the cingulum by a longitudinal groove (Fig. 67).



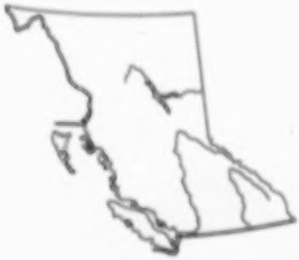
External measurements: TL= 104 (85–126) n=785, TV= 42 (32–58) n=793, HF= 12 (9–15) n=803, E= 7 (5–9) n=530, WT=5.3 g (3.0–10.0) n=801.

Dental Formula: incisors 1/1, unicuspids 5/1, premolars 1/1, molars 3/3.



SIMILAR SPECIES: resembles *S. trowbridgii* in cranial features and *S. monticolus* in external and cranial traits. See those species accounts for diagnostic traits.

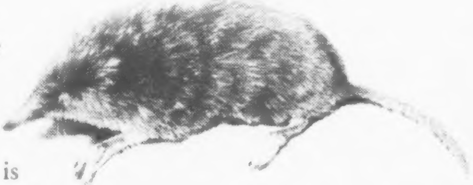
RANGE: Vancouver Island, the Gulf Islands, the southern mainland as far north as Lac La Hache and east to the Rocky Mountain trench.



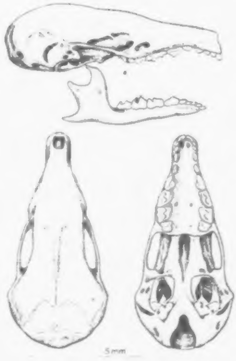
FAMILY TALPIDAE: MOLES

The limbs are short and close to the body; there are no external ears. The front feet have broad palms and long claws (Fig. 8). The skull has thin zygomatic arches (Fig. 53), the first pair of upper incisors are not enlarged with a hook, and the teeth lack red pigment (Figs. 54).

Neurotrichus gibbsii
(Shrew-mole)



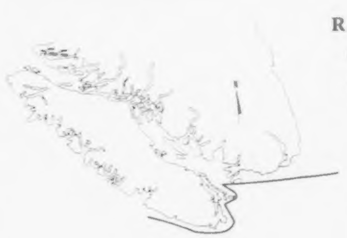
DESCRIPTION: a small mole that superficially appears shrew-like. It has a long snout, minute eyes hidden in the fur, a long thick scaly tail that is sparsely furred, and a forefoot with the palm longer than wide (Fig. 22). The skull has 36 teeth with only two pairs of upper and lower premolars.



External measurements: TL= 102 (98–125) n=183, TV= 37 (29–50) n=184, HF= 16 (14–19) n=184, WT=11.1 g (8.0–14.5) n=33.

Dental Formula: incisors 3/3, canines 1/1, premolars 2/2, molars 3/3

SIMILAR SPECIES: readily distinguished from our other moles by: a long tail, front palms longer than wide, small size (total length <140 mm), small skull (skull length <25.0 mm, palatal length <13.0 mm), and two pairs of upper and lower premolars.



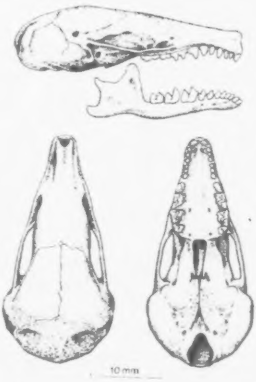
RANGE: the lower Fraser River valley and Cascade Range east to Princeton and north to Howe Sound.

Scapanus orarius (Coast Mole)

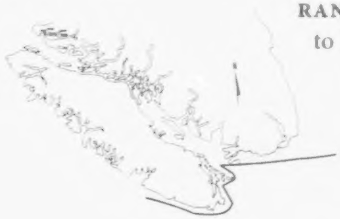
DESCRIPTION: a stocky mole with tiny eyes, short sparsely furred tail, and front feet that are enlarged with the palms wider than long (Fig. 23). The short velvety fur is greyish-brown with a distinct sheen. The skull has 44 teeth with four pairs of upper and lower preomolars.

External measurements: TL= 162 (145–181) n=129, TV= 33 (28–41) n=121, HF= 21 (18–24) n=128, WT= 69.1 g (46.0–78.1) n= 16 males; 56.6 g (45.6–66.9) n=15 females.

Dental Formula: incisors 3/3, canines 1/1, premolars 4/4, molars 3/3



SIMILAR SPECIES: the only similar species is Townsend's Mole (*S. townsendii*). The two species are similar in external appearance and cranial traits and *S. townsendii* can only be distinguished by size: total length >175 mm, tail vertebrae >24 mm, skull length >37.0 mm, palatal length >16.0 mm.



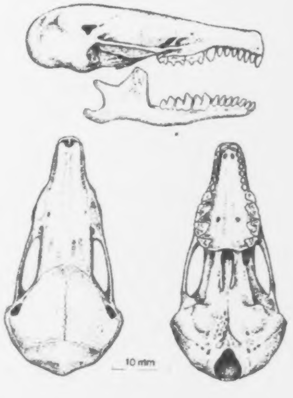
RANGE: the lower Fraser River valley east to Hope.

Scapanus townsendii (Townsend's Mole)

DESCRIPTION: external appearance and general cranial traits identical to *S. orarius*.

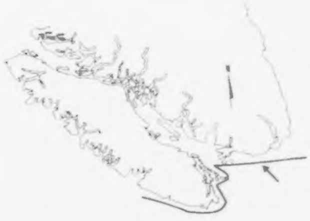
External measurements:
TL= 205 (179–237) n=30,
TL= 38 (31–45) n=30,
HF= 25 (23–29) n=31,
WT= 137.9 g (121.0–164.0) n=7 males; 113.5 g (96.0–122.0) n= 5 females.

Dental Formula: incisors 3/3, canines 1/1, premolars 4/4, molars 3/3.



SIMILAR SPECIES: can only be confused with the Coast Mole (*Scapanus orarius*); see that account for diagnostic traits.

RANGE: restricted to a localized area around Huntingdon and Abbotsford in extreme southwestern British Columbia.

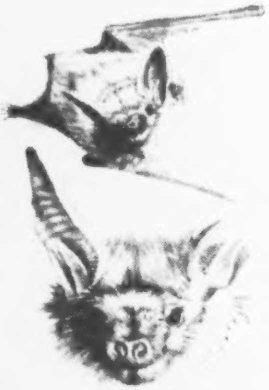


ORDER CHIROPTERA: BATS

The forelimb is modified into a wing; the skull has a palatal emargination and canine teeth that are larger than the incisors.

FAMILY VESPERTILIONIDAE: VESPERTILIONID BATS

Antrozous pallidus (Pallid Bat)

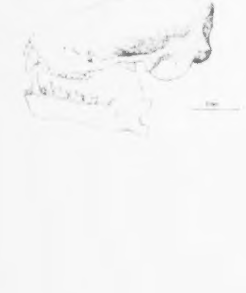


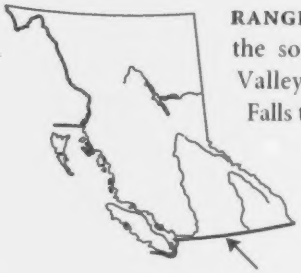
DESCRIPTION: a large bat with short fine fur that is light brown in colour. The ears are long and broad; the tragus has a serrated outer edge. The snout is square with a shallow ridge. The calcar lacks a keel (Fig. 28). The skull is large with robust teeth; it is the only British Columbian bat with two pairs of lower incisors.

External measurements: TL= 115 (110–121) n=4, TV= 47 (44–51) n=4, HF= 13 (11–14) n=4, E= 29 (28–30) n=3, TR= 15 n=1, FA= 54.4 (50.3–58.0) n=15, WT=20.1 g (17.1–24.3) n=14.

Dental Formula: incisors 1/2, canines 1/1, premolars 1/2, molars 3/3.

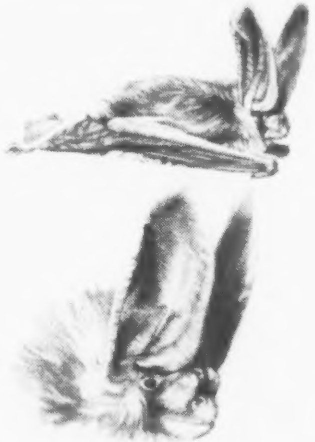
SIMILAR SPECIES: none.





RANGE: known only from the southern Okanagan Valley from Okanagan Falls to Osoyoos.

Corynorhinus townsendii (Townsend's Big-eared Bat)

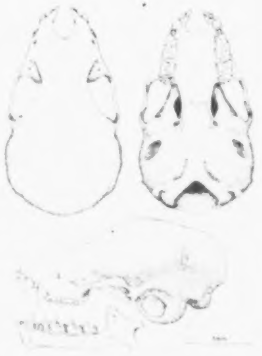


DESCRIPTION: a medium-sized bat with enormous ears and two prominent glandular swellings or lumps on the nose. The pelage varies from pale brown to blackish-grey. The calcar lacks a keel (Fig. 28).

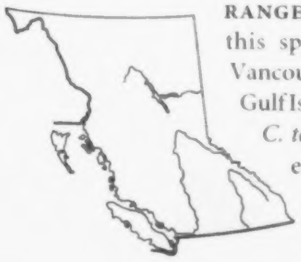
External measurements: TL= 100 (83–113) n=52, TV= 46 (38–57) n=44, HF= 11 (7–10) n=51, E= 34 (27–40) n=26, TR= 13 (10–15) n=11, FA= 42.6 (39.0–45.2) n=55, WT= 8.6 g (6.0–13.5) n=15.

Dental Formula: incisors 2/3, canines 1/1, premolars 2/3, molars 3/3.

SIMILAR SPECIES: the Pallid Bat (*A. pallidus*) and Spotted Bat (*Euderma maculatum*) are the only other bats in the province with such large ears. *A. pallidus* is larger (forearm 50-58 mm) and *E. maculatum* is readily identified by its distinctive jet black fur and white markings.

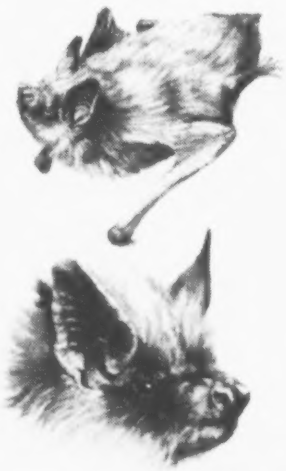


The Silver-haired Bat (*Lasionycteris noctivagans*) is the only other British Columbian bat that shares the same dental formula. The skull of *L. noctivagans* can be distinguished by its flatter profile.



RANGE: On the coast, this species inhabits Vancouver Island, the Gulf Islands, and the lower mainland. In the interior, *C. townsendii* ranges north to Williams Lake and east to Cranbrook.

Eptesicus fuscus (Big Brown Bat)

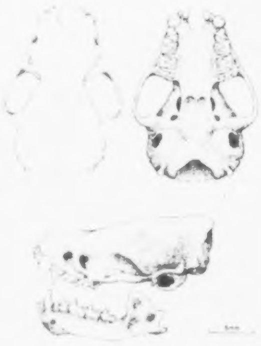


DESCRIPTION: a large bat with long lax fur with an oily sheen. The pelage ranges from pale brown in interior populations to dark brown in coastal populations. The ears just reach the nose when pushed forward. The calcar has a prominent keel (Fig. 27). The robust skull has a flattened braincase, heavy jaw, and large teeth.

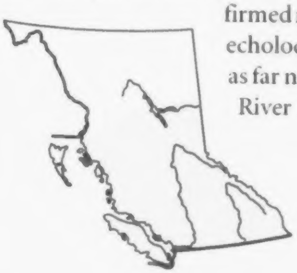
External measurements: TL= 116 (98–131) n=126, TV= 46 (37–55) n=123, HF= 12 (8–15) n=115, E= 15 (11–21)n=53, TR= 8 (5–11) n=40, FA= 47.5 (43.0–52.0) n=109, WT=15.2 g (8.8–21.9) n=36.

Dental Formula: incisors 2/3, canines 1/1, premolars 1/2, molars 3/3.

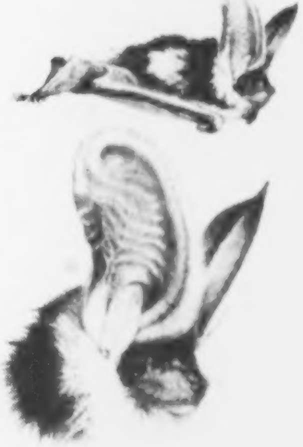
SIMILAR SPECIES: its larger size (forearm >42 mm), longer fur, and two pairs of lower premolars are traits that distinguish *E. fuscus* from any of our *Myotis* species.



RANGE: Vancouver Island, the coastal mainland north to Terrace, and north to the Peace River region in the interior. There are unconfirmed records based on echolocation calls from as far north as the Liard River region.



Euderma maculatum (Spotted Bat)



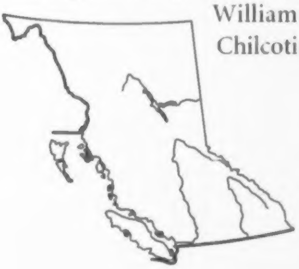
DESCRIPTION: the fur is black with white spots on the rump and shoulders. The ears are enormous (ear >30 mm, tragus >12 mm). The skull has an elongated braincase with a gradually sloping forehead. The dental formula is unique among British Columbian bats.

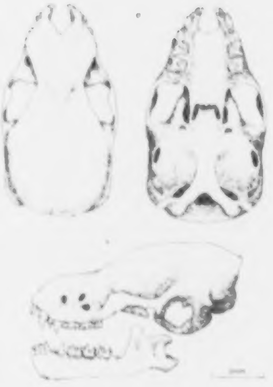
External measurements: TL= 125 n=1, TV= 55 n=1 HF= 10 n=1 E= 39 n=1, TR= 14 n=1, FA= 51.2 (47.9–53.1) n=6, WT= 17.9 g (16.2–21.4) n=5.

Dental Formula: incisors 2/3, canines 1/1, premolars 2/2, molars 3/3.

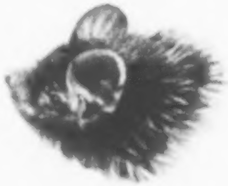
SIMILAR SPECIES: none.

RANGE: Fraser, Okanagan, Similkameen, and Thompson valleys of the dry interior north to Williams Lake and the Chilcotin River.





Lasionycteris noctivagans (Silver-haired Bat)



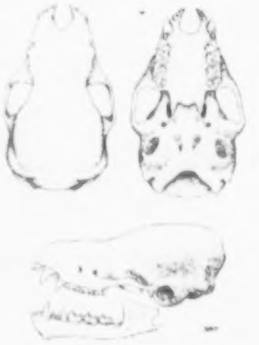
DESCRIPTION: the fur is dark brown or black with some white or silver-tipped hairs that give it a frosted appearance. The dorsal surface of the tail membrane is lightly furred. The ears are short and round; the calcar lacks a keel (Fig. 28). The skull is flat in profile with a blunt rostrum.

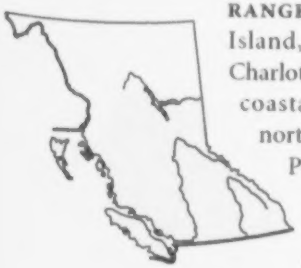
External measurements: TL= 100 (90–117) n=68, TV= 41 (31–50) n=70, HF= 9 (6–11) n=69, E= 12 (9–15) n=17, TR= 7 (4–8) n=22, FA= 41.4 (39.1–43.9) n=56, WT=9.0 g (5.8–12.4) n=14.

Dental Formula: incisors 2/3, canines 1/1, premolars 2/3, molars 3/3.

SIMILAR SPECIES: only the Hoary Bat (*L. cinereus*) is similar in colour. *L. noctivagans* is smaller (forearm <44 mm), and has less fur on the dorsal surface of its tail membrane.

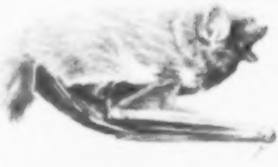
Townsend's Big-eared Bat (*C. townsendii*) is the only British Columbia species that shares the same dental formula. The skull of *L. noctivagans* can be distinguished by its flatter profile.

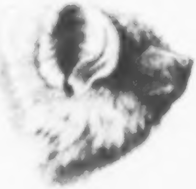




RANGE: Vancouver Island, the Queen Charlotte Islands, the coastal mainland north to Rivers Inlet, and the interior north to the Peace River region. There are unconfirmed records based on echolocation calls from as far north as the Liard River region.

Lasiurus blossevillii (Western Red Bat)





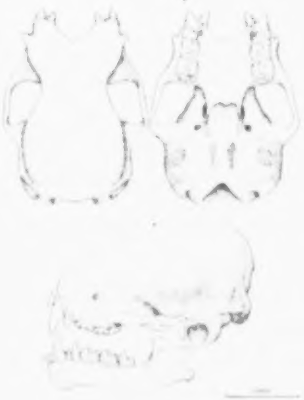
DESCRIPTION: a large bat with striking orange to rusty red fur. A faint frosting is visible on the tips of some hairs; the dorsal surface of the tail membrane is densely furred. The calcar has a keel (Fig. 27). The skull has a short broad rostrum and rounded high braincase; there is only one pair of upper incisors.

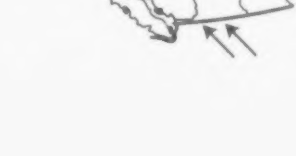
External measurements[25]: TL= 107 (87-120) n=98, TV= 50 (35-60) n=98, HF= 9 (6-13) n=97, E= 12 (9-14) n=81, TR= 6 (5-7) n=26, FA= 38.8 (34.0-42.0) n=19, WT= 10.8 g (7.2-18.5) n=73.

Dental Formula: incisors 1/3, canines 1/1, premolars 2/2, molars 2/3.

SIMILAR SPECIES: no species resembles *L. blossevillii* in colour. *L. cinereus* shares the same dental formula but has a larger skull (skull length >15 mm).

RANGE: known from only two localities: the Skagit River and Okanagan Falls.





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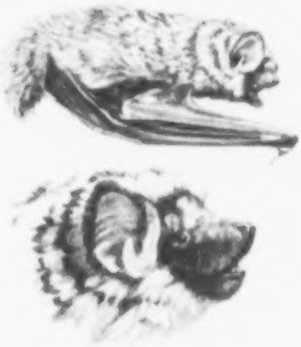
[25] Based on a series of specimens from California.

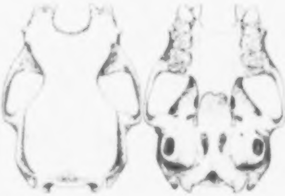
Lasiurus cinereus (Hoary Bat)



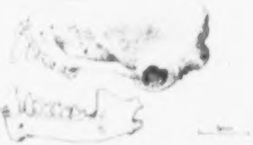
DESCRIPTION: our largest bat, it has a beautiful frosted pelage. The hairs on the back are a mix of dark brown and grey tinged with white. Yellow fur is present on the throat, ears, and undersides of the wing membrane. The dorsal surface of the tail membrane is heavily furred. The ears are round and short; the calcar has a keel (Fig. 27). The skull has a short broad rostrum and rounded high braincase; there is only one pair of upper incisors.

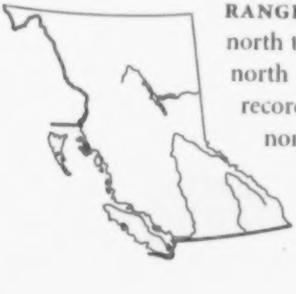
External measurements[26]: TL= 137 (125-144) n=11, TV= 60 (50-66) n=10, HF= 12 (10-15) n=12, E= 14 (13-16) n=4, TR= 9 (9-10) n=4, FA= 54.5 (50.3-57.4) n=24, WT= 28.4 g (20.1-37.9) n=43.

Dental Formula: incisors 1/3, canines 1/1, premolars 2/2, molars 3/3



SIMILAR SPECIES: the pelage vaguely resembles the Silver-haired Bat (*L. noctivagans*); see that species account for diagnostic traits. The skull is similar to that of the Western Red Bat (*L. blossevillii*) but is larger in size (see previous account).





RANGE: Vancouver Island, the southern mainland north to Garibaldi Provincial Park, and the interior north to Williams Lake. There are unconfirmed records based on echolocation calls from as far north as the Liard River region.

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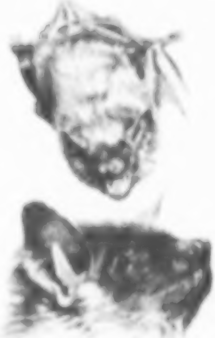
[26] Forearm lengths and weights include a sample from Alberta.

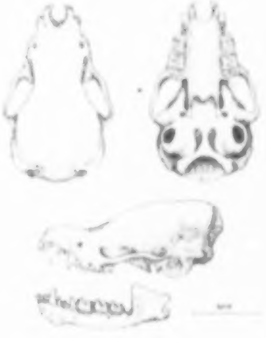
Myotis californicus (California Myotis)



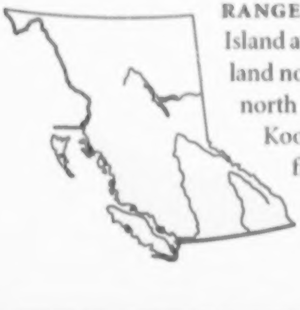
DESCRIPTION: one of our smallest *Myotis* species, its pelage ranges from rusty brown in interior populations to blackish brown in coastal populations. The calcar has a prominent keel (Fig. 27). The skull is small with a steeply sloped forehead (Fig. 79).

External measurements: TL= 80 (65–95) n=75, TV= 36 (26–41) n=77, HF= 6 (5–9) n=80, E= 13 (8–15) n=40, TR= 4 (4–8) n=35, FA= 32.1 (29.4–35.0) n=68, WT= 4.4 g (3.3–5.4) n=26.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.

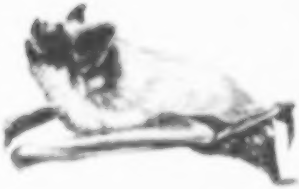


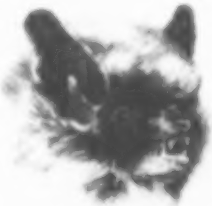
SIMILAR SPECIES: the small skull (post-orbital width <4.0 mm), and combination of small forearm (<35 mm) and hind foot (< 9 mm) with a keeled calcar are traits that distinguish this bat from all other British Columbia *Myotis* species except the Western Small-footed Myotis (*M. ciliolabrum*). *M. ciliolabrum* can be discriminated by: paler fur with sharply contrasting black wings, face, and ears; longer bare area on snout (Fig. 31); and the skull with a more gradually sloping forehead (Fig. 80). In Californian populations, Constantine (1998) found that the tail of *M. ciliolabrum* extended about 4 mm beyond the border of the interfemoral membrane whereas *M. californicus* lacked a free tail. This may be a useful trait for identifying live captures but its reliability needs to be assessed for British Columbia populations of *M. californicus* and *M. ciliolabrum*.



RANGE: various coastal islands including Vancouver Island and the Queen Charlotte Islands, coastal mainland north to the Bella Coola Valley, and the interior north to Wells Gray Provincial Park and east to the Kootenays. There are unconfirmed live captures from as far north as the Liard River region.

Myotis ciliolabrum
(Western Small-footed Myotis)





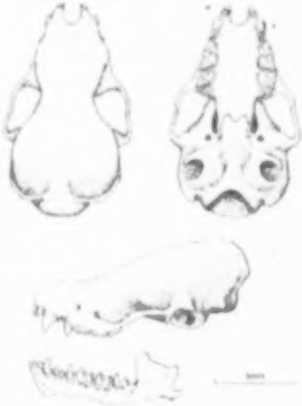
DESCRIPTION: one of our smallest *Myotis* species, the dorsal pelage is pale tan to buff. Its black ears, snout, and wing membranes contrast strongly with the paler dorsal fur. The calcar has a keel (Fig. 27). The skull is small with a gradually sloped forehead (Fig. 80).

External measurements: TL= 83 (72–90) n=44, TV= 38 (32–45) n=44, HF= 7 (6–8) n=44, E= 13 (8–15) n=25, TR= 7 (4–9) n=24, FA= 31.8 (28.8–33.4) n=47, WT= 4.6 g (2.8–5.5) n=23.

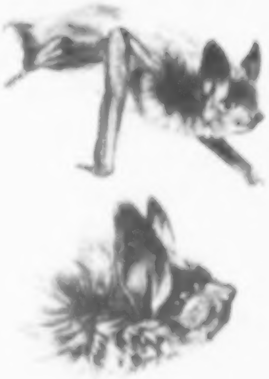
Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.

SIMILAR SPECIES: the California Myotis (*M. californicus*) is the only bat as small and with a keeled calcar. See that account for diagnostic traits.

RANGE: the Fraser, Okanagan, Similkameen, and Thompson valleys of the dry interior, north to Williams Lake.



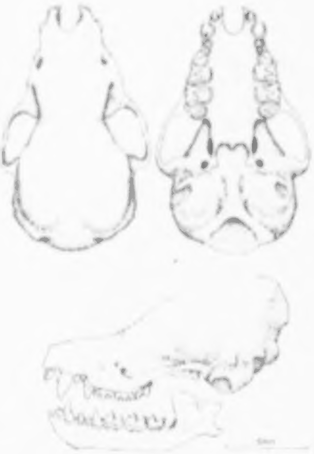
Myotis evotis (Western Long-eared Myotis)



DESCRIPTION: a large *Myotis* with long ears (usually >18 mm). The fur colour is extremely variable ranging from nearly black on the coast to brown in the dry interior. Distinct shoulder patches are evident on paler individuals but they may be indistinct in coastal populations. The calcar lacks a distinct keel (Fig. 28). A fringe of tiny hairs (visible with a hand lens) is present on the outer edge of the tail membrane.

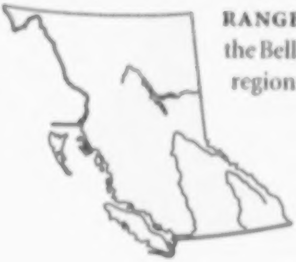
External measurements: TL= 92 (74–103) n=54, TV= 42 (31–50) n=51, HF= 9 (7–11) n=51, E= 20 (17–22) n=31, TR= 10 (8–12) n=21, FA= 38.6 (36.0–42.0) n=47, WT= 5.5 g (4.2–8.6) n=25.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.



SIMILAR SPECIES: the distribution overlaps with three other long-eared *Myotis* species in British Columbia: Keen's Long-eared Myotis (*M. keenii*), Northern Long-eared Myotis (*M. septentrionalis*), and Fringed Myotis (*M. thysanodes*). *M. thysanodes*) is larger (forearm usually >42 mm), and has a very prominent fringe of hairs on the outer edge of the tail membrane that is visible with the naked eye. The skull of *M. thysanodes* has a broader palate (width across upper molars, M^2-M^2>6.2 mm). *M. septentrionalis* has smaller ears (usually <18 mm), lacks the tiny fringe of hairs on the tail membrane and shoulder patches, and its skull has a shorter toothrow (last upper premolar to last upper molar, P^4-M^3 <4.2 mm).

Although *M. keenii* averages smaller in forearm length and ear length, these measurements overlap among individuals of the two species. The skull of *M. keenii* usually has a shorter toothrow (distance from last upper premolar to last upper molar <4.2 mm; maxillary toothrow length <5.8 mm) but even these traits overlap with *M. evotis*. Positive identification can only be made from a multivariate discriminant analysis using a number of skull and dental measurements (see van Zyll de Jong and Nagorsen 1994).



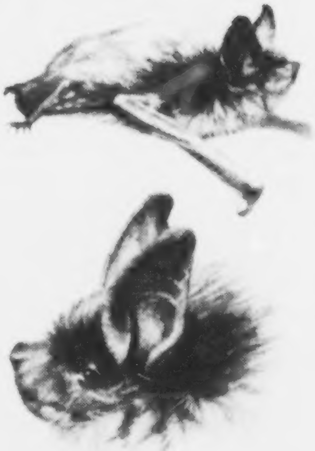
RANGE: Vancouver Island, coastal mainland north to the Bella Coola Valley, interior north to the Liard River region.

Myotis keenii (Keen's Long-eared Myotis)

DESCRIPTION: a medium-sized *Myotis* with dark fur and indistinct shoulder patches. A tiny fringe of hairs is evident on the outer edge of the tail membrane. The ears are long (usually >16 mm); the calcar lacks a distinct keel (Fig. 28).

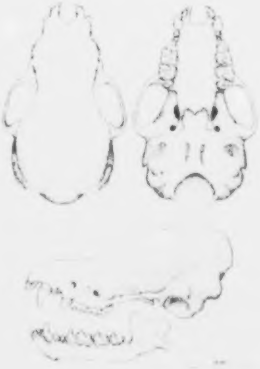
External measurements: TL= 84 (63–94) n=33, TV= 40 (32–44) n=33, HF= 9 (8–10) n=32, E= 18 (16–20) n=38, TR= 11 (9–12) n=41, FA= 36.0 (34.2–38.5) n=43, WT= 5.1 g (4.0–5.9) n=35.

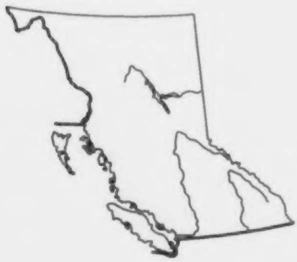
Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3



SIMILAR SPECIES: Western Long-eared Myotis (*Myotis evotis*); see that account for diagnostic traits.

RANGE: restricted to the Pacific coast where it ranges as far north as the Stikine River on the mainland and Vancouver Island and the Queen Charlotte Islands.



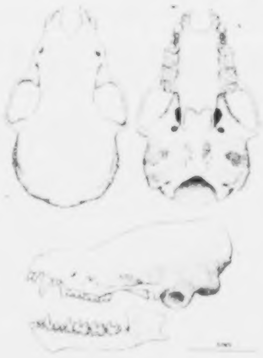


Myotis lucifugus (Little Brown Myotis)

DESCRIPTION: the pelage varies from nearly black in coastal populations to tan or olive in the dry interior. The ears reach the nostrils when pushed forward; the calcar lacks a keel (Fig. 28). The skull has a gradually sloped forehead (Fig. 80).

External measurements: TL= 86 (70–108) n=383, TV= 37 (25–59) n=379, HF= 10 (6–13) n=385, E= 13 (9–17) n=217, TR= 7 (4–10) n=151, FA= 36.4 (33.0–40.3) n=295, WT= 6.2 g (3.0–10.2) n=98.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.



SIMILAR SPECIES: the only *Myotis* species with a similar ear size and lacking a keeled calcar is the Yuma Myotis (*M. yumanensis*). *M. lucifugus* has longer, glossier fur and is generally larger (forearm >36 mm, skull length >14 mm). The skull of *M. lucifugus* has a more gradually sloping braincase than the skull of *M. yumanensis*. Nonetheless, distinguishing the two species is difficult in some areas of the province with some individuals intermediate in cranial and body size (see Herd and Fenton 1983).

RANGE: the largest range of any British Columbian bat, inhabiting the entire province including Vancouver Island and the Queen Charlotte Islands.

Myotis septentrionalis
(Northern Long-eared Myotis)

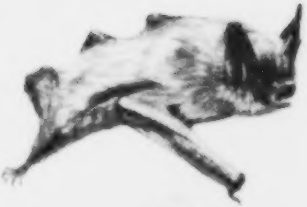
DESCRIPTION: a medium-sized *Myotis* with long ears, dark fur, and no shoulder patches. The outer edge of the tail membrane is bare or with only a few scattered hairs. The calcar lacks a prominent keel (Fig. 28).

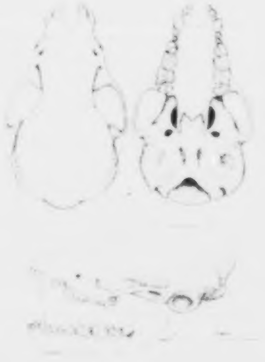
External measurements: TL= 86 (78–93) n=3, TV= 37 (30–45) n=4, HF= 9 (8–10) n=4, E= 17 (16–18) n=3, TR= 10 (10–10) n=2, FA= 37.9 (35.6–40.0) n=3, WT= 5.6 g (5.1–6.5) n=3.

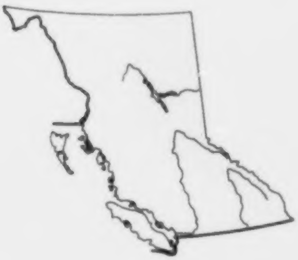
Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.

SIMILAR SPECIES: the Western Long-eared Myotis (*M. evotis*), see that species account for diagnostic traits.

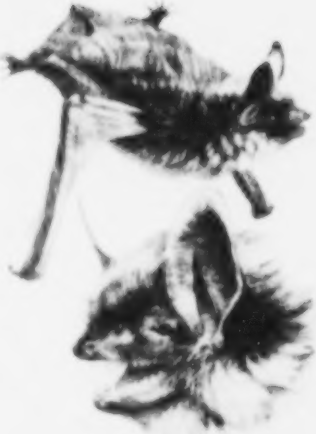
RANGE: known from Mount Revelstoke National Park and north-eastern British Columbia from the Peace River to the Liard River area.







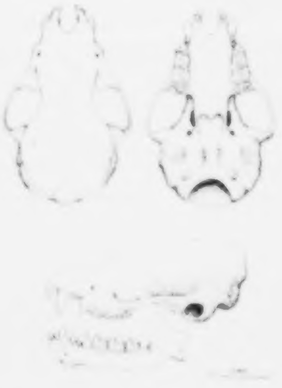
Myotis thysanodes (Fringed Myotis)



DESCRIPTION: the largest *Myotis* species in British Columbia, it has pale brown fur, and long ears. The outer edge of the tail membrane has a stiff fringe of hairs that can be seen with the naked eye (Fig. 25). The calcar is not keeled (Fig. 28).

External measurements: TL= 90 (88–93) n=7, TV= 42 (40–44) n=7, HF= 10 (8–11) n=7, E= 19 (18–20) n=7, TR= 9 (8–11) n=4, FA= 42.3 (40.0–44.5) n=38, WT= 7.1 g (5.4–8.4) n=35.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.



SIMILAR SPECIES: the only other long-eared *Myotis* bat known to occur within its range is the Western Long-eared Myotis (*M. evotis*); see that species account for diagnostic traits.

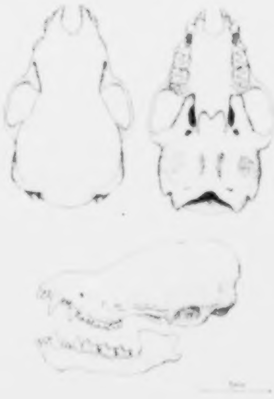
RANGE: the Fraser, Okanagan, Thompson, and Similkameen valleys of the dry interior north to Williams Lake. Because there are records from coastal regions of Oregon and Washington State, *M. thysanodes* could inhabit coastal regions of southwestern British Columbia.

Myotis volans (Long-legged Myotis)

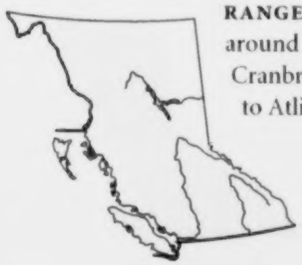
DESCRIPTION: one of the largest *Myotis* species in British Columbia, with hairs on the belly that extend to the undersides of the wing membranes as far as the knees and elbows (Fig. 29). The ears are more rounded in profile than any of our other *Myotis* species. The calcar has a prominent keel (Fig. 27). The skull has a strongly elevated braincase (Fig. 77).

External measurements: TL= 94 (83–105) n=33, TV= 43 (37–54) n=33, HF= 9 (7–10) n=31, E= 12 (9–15) n=22, TR= 6 (5–7) n=17, FA= 38.3 (34.0–43.0) n=46, WT= 7.2 g (5.5–10.0) n=18.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.



SIMILAR SPECIES: there are only three bats in British Columbia with prominent keels that could be confused with this species: the California Myotis (*M. californicus*), Western Small-footed Myotis (*M. ciliolabrum*), and Big Brown Bat (*E. fuscus*). *M. californicus* and *M. ciliolabrum* are much smaller (forearm <35 mm, hind foot <9 mm) with more pointed ears; their skulls lack the strongly elevated braincase. *E. fuscus* is larger (forearm 41-52 mm) and lacks the fur extending as far as knee and elbow. The skull of *E. fuscus* has only two upper premolars and lacks the strongly elevated braincase.



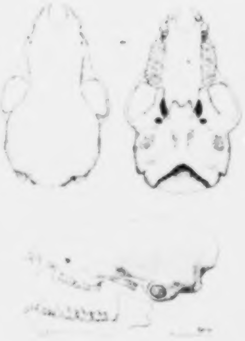
RANGE: Vancouver Island, the coastal mainland around Vancouver, the southern interior as far east as Cranbrook and Revelstoke National Park, and north to Atlin and the Liard River area.

Myotis yumanensis (Yuma Myotis)

DESCRIPTION: the pelage varies from nearly black in coastal populations to pale brown in the dry interior. The pelage tends to be dull and lacks a distinct sheen; the calcar lacks a keel (Fig. 28). The skull has a steeply sloped forehead (Fig. 79).

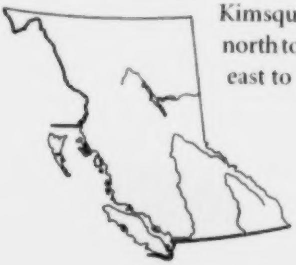
External measurements: TL= 82 (60–99) n=322, TV= 36 (27–45) n= 324, HF= 9 (6–13) n=323, E= 14 (8–16) n=202, TR= 7 (5–10) n=212, FA= 34.3 (30.0–38.0) n=273, WT= 6.6 g (4.0–8.5) n=153.

Dental Formula: incisors 2/3, canines 1/1, premolars 3/3, molars 3/3.



SIMILAR SPECIES: the only similar species is the Little Brown Myotis (*M. lucifugus*); see that account for diagnostic traits.

RANGE: Various coastal islands including Vancouver Island, the coastal mainland north to Kimsquit, and the interior north to Williams Lake and east to Nelson.



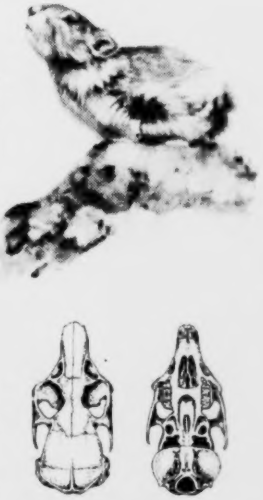
ORDER LAGOMORPHA: LAGOMORPHS

The tail is either "powder-puff" like or inconspicuous, soles of the feet are furred, the front foot has five digits, and the hind foot has four digits. The nostrils are surrounded by a rim of sparsely haired skin. The skull has a fenestrate rostrum, two pairs of upper and one pair of lower incisors, no canine teeth, and a space (diastema) that separates the incisors from the cheek teeth. The cheek teeth are not rooted.

FAMILY OCHOTONIDAE: PIKAS

Small lagomorphs with short and nearly circular ears, the tail is not visible, and the hind limbs are only slightly longer than front limbs. The skull is flat with a short narrow rostrum that has a single oval fenestration (Fig. 83); there are no supraorbital process (Fig. 82).

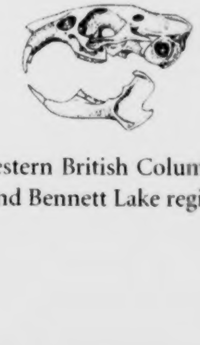
Ochotona collaris (Collared Pika)



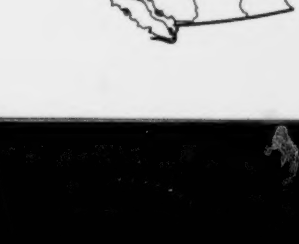
DESCRIPTION: the dorsal pelage is dull grey with some buffy fur on the head and back. An indistinct grey collar is present on the neck and shoulders. The ventral pelage is white.

External measurements: TL= 197 (170–217) n=18, HF= 32 (28–34) n=18, E= 22 (20–22) n=7, WT= 146.7 g (123.0–173.0) n=7.

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3



SIMILAR SPECIES: the only similar species is the American Pika (*O. princeps*) but its distribution is separated from that of *O. collaris* by a hiatus of about 800 km in central British Columbia. *O. princeps* can be distinguished by its brown dorsal pelage that lacks a distinct collar, but the two species overlap extensively in skull and dental measurements.



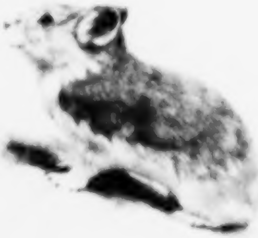
RANGE: extreme north-western British Columbia in the Haines Triangle and Bennett Lake region.

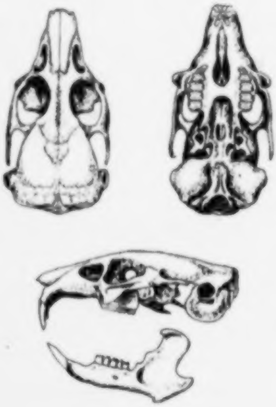
Ochotona princeps (Common Pika)

DESCRIPTION: the dorsal fur colour is extremely variable among the various subspecies found in British Columbia, ranging from pale grey or brown to blackish-brown in coastal races. The species lacks a distinct collar.

External measurements: TL= 178 (154–207) n= 456, HF= 31 (26–36) n=463, E= 21 (19–25) n=65, WT= 162.3 g (142.5–190.4) n=18.

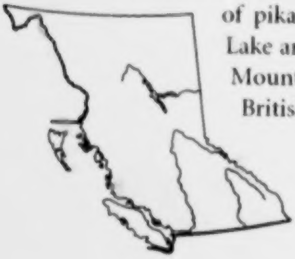
Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3





SIMILAR SPECIES: see account for the Collared Pika (*O. collaris*).

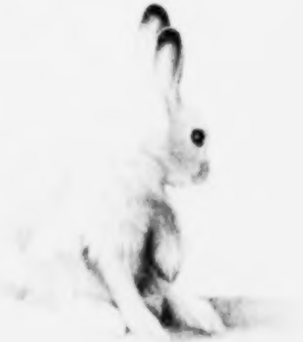
RANGE: northern limits are Kimsquit in the Coast Mountains, the Itcha Mountains in the Chilcotin region, Bowron Lakes Provincial Park in the Cariboo Mountains, and Mount Robson Provincial Park in the Rocky Mountains. There are unconfirmed reports of pikas from Ootsa Lake and the Bulkley Mountains in central British Columbia.



FAMILY LEPORIDAE: HARES AND RABBITS

The ears are long, and the hind limbs have long feet. The skull is arched with prominent supraorbital processes (Figs. 84, 86); the rostrum is long and wide with lattice-like fenestrations (Fig. 85).

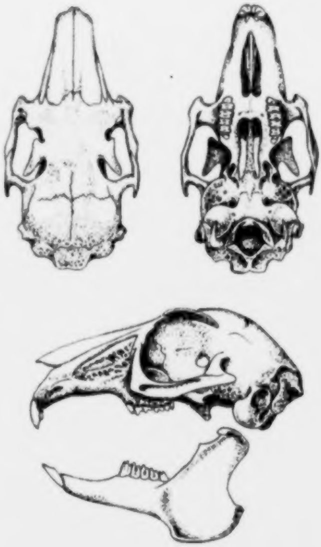
Lepus americanus
(Snowshoe Hare)



DESCRIPTION: a medium-sized hare with long ears. Except for populations in the lower Fraser Valley (i.e., subspecies *washingtonii*) which remain brown all year, the winter pelage is white with black ear tips. Summer pelage is brown but the dorsal surface of the hind feet often remains white, and the outer margins of the black-tipped ears are white. In spring and autumn the pelage is a mix of white and brown. The skull has an indistinct interparietal bone (Fig. 86) and the posterior extensions of the supraorbital processes are usually free of the braincase (Fig. 86).

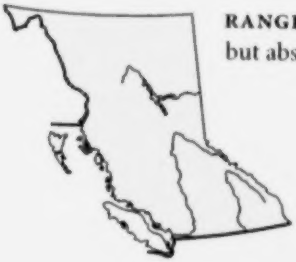
External measurements: TL= 443 (388–530) n=139, TV= 39 (20–61) n=116, HF= 135 (117–155) n=133, E= 72 (64–95) n=49, WT= 1.34 kg (0.89–1.92) n=12.

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3.



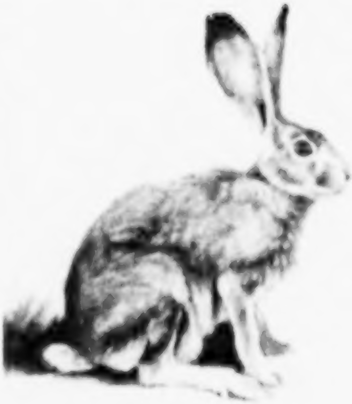
SIMILAR SPECIES: throughout most of the province this is the only species of hare or rabbit. However, where its distribution overlaps with the White-tailed Jackrabbit (*L. townsendii*) and Nuttall's Cottontail (*Sylvilagus nuttallii*) in the Okanagan Valley, and with the introduced Eastern Cottontail (*Sylvilagus floridanus*) in the Fraser River valley, identification can be problematic.

L. townsendii is larger (ear >100 mm, basilar length of skull >69.0 mm, maxillary toothrow length >16.0 mm) and has a silver-grey pelage. Cottontails (*S. floridanus* and *S. nuttallii*) have smaller hind feet (<115 mm), a rufous or brown nape on the back of the head (Fig. 33), and a distinct interparietal bone in their skull (Fig. 84).



RANGE: the entire mainland of British Columbia but absent from coastal islands.

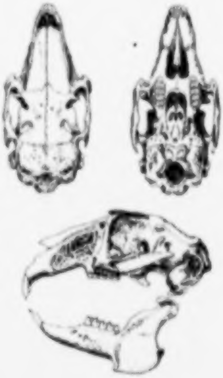
Lepus townsendii (*White-tailed Jackrabbit*)



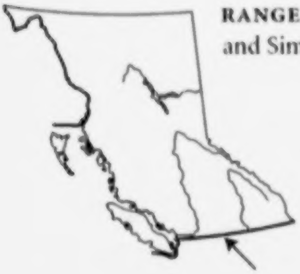
DESCRIPTION: a large hare with long hind legs and very long, black-tipped ears. In summer the dorsal pelage is light grey mixed with pale brown. In winter, the dorsal pelage appears silvery-white washed with brown. The skull is large with an indistinct interparietal bone (Fig. 86), broad rostrum, and supraoccipital processes that usually touch the braincase.

External measurements: TL= 564 (510-602) n=11, TV= 90 (75-113) n=11, HF= 150 (137-171) n=11, E= 120 (109-137) n=3, WT=2.54-2.56 kg n=2[27]

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3



SIMILAR SPECIES: co-occurs with Nuttall's Cottontail (*S. nuttallii*) and the Snowshoe Hare (*L. americanus*) in southern British Columbia but *L. townsendii* can be readily identified by its larger size especially the longer ears (>100 mm) and larger skull (basilar length>69.0 mm, maxillary toothrow length > 16.0 mm). *L. americanus* turns white in winter, but its winter pelage is nearly pure white rather than dirty silver-grey.



RANGE: historically inhabited the southern Okanagan and Similkameen valleys but probably extirpated.

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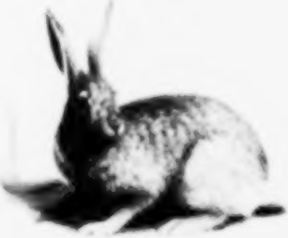
[27] No weights available for the historical British Columbian population, taken from Verts and Carraway (1998).

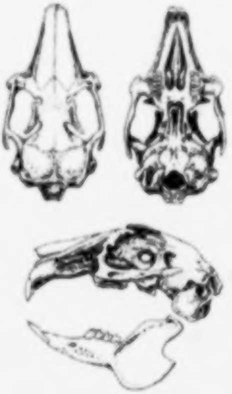
Oryctolagus cuniculus (European Rabbit)



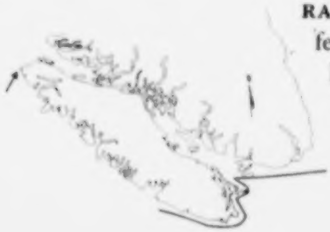
DESCRIPTION: a medium to large rabbit that is extremely variable in fur colour (black to white) and markings depending on the domestic breed. Brown individuals have a rufous brown nape at the dorsal base of the head (Fig. 33). The skull has a distinct interparietal bone (Fig. 84) and the posterior extension of the supraorbital processes are free of the braincase.

External measurements: TL= 569 (500–620) n=4, TV= 70 (55–85) n=4, HF= 112 (102–121) n=5, E= 116 (84–152) n=5, WT= 3.26 kg (2.90–3.95) n=4.

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3

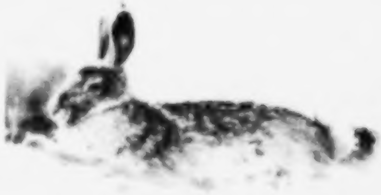


SIMILAR SPECIES: most breeds have distinctive colour and markings (ranging from black to white) that readily distinguish them from our wild rabbits and hares. However, brown *O. cuniculus* could be confused with the Snowshoe Hare (*L. americanus*) or cottontail species (*S. floridanus* and *S. nuttallii*). *O. cuniculus* is larger (total length >490 mm), more heavily built, and has longer ears (> 80 mm) than cottontails (*Sylvilagus*); the brownish nape and heavier build will discriminate *O. cuniculus* from *L. americanus* in summer pelage. The skull of *O. cuniculus* can be discriminated from that of *L. americanus* by its distinct interparietal bone. Cottontail (*Sylvilagus*) skulls have a distinct interparietal but the tip of the posterior extension of their supraorbital processes touch the braincase.



RANGE: generally a domestic mammal but feral populations occur on Triangle Island. Localized feral populations periodically appear in other parts of the province but they rarely persist.

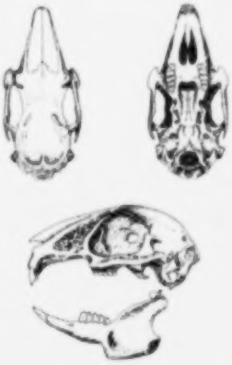
Sylvilagus floridanus (Eastern Cottontail)



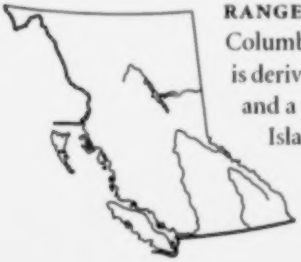
DESCRIPTION: a medium-sized rabbit with brownish pelage and a rufous or brownish nape on the back of the head (Fig. 33). The ears are black-tipped; the ventral pelage is white. The skull has a distinct interparietal bone (Fig. 84) and supraoccipital processes that touch the braincase.

External measurements: TL= 423 (370–449) n=31, TV= 51 (35–70) n=31, HF= 99 (90–110) n=31, E= 68 (61–76) n=14, WT= .33 kg (1.11-1.72) n=32.

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3



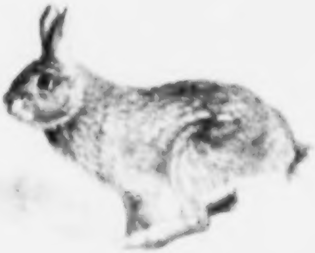
SIMILAR SPECIES: could be confused with Snowshoe Hares (*L. americanus*) in summer pelage and with brown forms of *O. cuniculus* (see those accounts for diagnostic traits).



RANGE: two introduced populations occur in British Columbia: a lower Fraser River valley population that is derived from introductions to western Washington and a population recently introduced to Vancouver Island.

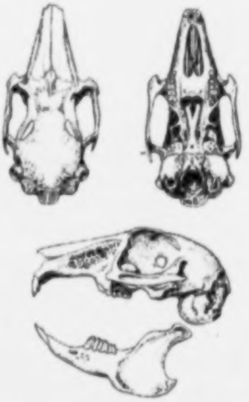
Sylvilagus nuttallii (Nuttall's Cottontail)

DESCRIPTION: our smallest rabbit, it has a dorsal pelage characterized by pale brown fur with grey on the sides and rump, and a pale brown nape (Fig. 33). The ears are tipped with black. The ventral pelage is white. The skull is small with a distinct interparietal bone (Fig. 84) and supraoccipital processes that touch the braincase.

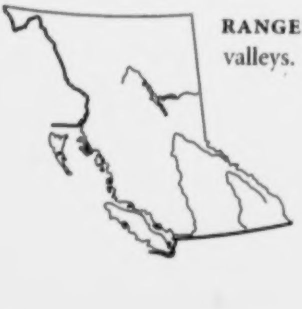


External measurements: TL= 319 (263–363) n=9, TV= 33 (24–44) n=9, HF= 85 (75–90) n=9, E= 57 (54–58) n=4, WT= 495.4 g (341.9–777.5) n=4.

Dental Formula: incisors 2/1, canines 0/0, premolars 3/2, molars 3/3



SIMILAR SPECIES: in British Columbia, the distributions of the Eastern Cottontail (*S. floridanus*) and Nuttall's Cottontail (*S. nuttallii*) are not in contact. But, *S. nuttallii* can be discriminated from *S. floridanus* by smaller body size (weight< 700 g, ear <60 mm), duller fur colour, and smaller skull (basilar length <57 mm, maxillary toothrow length <14 mm). Snowshoe Hares (*L. americanus*) in summer pelage could be confused with this species. *L. americanus* lacks the brown nape on the back of the head, is much larger (hind foot >115 mm, ear >60 mm); its skull is discriminated by: an indistinct interparietal bone, supraoccipital processes that are free of the braincase, and larger size (basilar length >57 mm, maxillary toothrow length >14 mm).



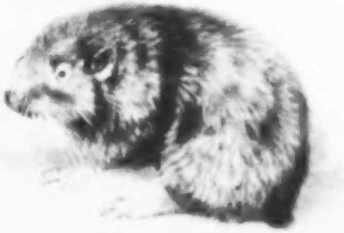
RANGE: the southern Okanagan and Similkameen valleys.

ORDER RODENTIA: RODENTS

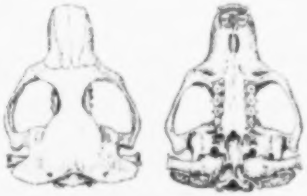
The external appearance is diverse with the anatomy of some species highly modified for specializations associated with locomotion. The skull is characterized by a single pair of upper incisors, no canines, the incisors separated from cheek teeth by a space, and the rostrum lacking fenestrations. All British Columbia rodents have rooted cheek teeth, except for some species of voles, the Mountain Beaver (*Aplodontia rufa*), and Northern Pocket Gopher (*Thomomys talpoides*) which have ever-growing cheek teeth.

FAMILY APLODONTIDAE: MOUNTAIN BEAVERS

Aplodontia rufa (Mountain Beaver)

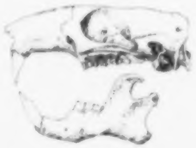


DESCRIPTION: a thickset rodent with dark brown fur, short limbs, an indistinct stubby tail, small eyes and ears, and long claws on the front feet. The skull is flattened, and triangular in outline with flask-shaped auditory bullae (Fig. 129), no postorbital processes, and molars with distinct projections on their cheek sides.

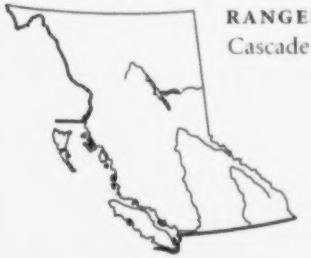


External measurements: TL= 349 (260–470) n=88, TV= 27 (17–47) n=72, HF= 57 (48–68) n=77, E= 20 (16–22) n=5, WT= 1.05 (0.67–1.30) n=7.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3.



SIMILAR SPECIES: none, but curiously, young marmots (*Marmota*) have been misidentified as *A. rufa*. Marmots have a bushy tail and short claws.

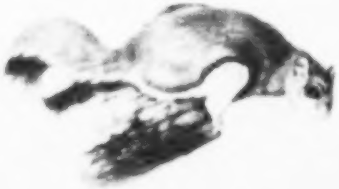


RANGE: southwestern British Columbia in the Cascade Range and lower Fraser River valley.

FAMILY SCIURIDAE: SQUIRRELS

Species typically have a bushy tail and dense fur. There are four toes on the front feet and five on the hind feet. Some species have internal cheek pouches. The skull has pronounced postorbital processes, a wide interorbital area, and a small infraorbital opening (Fig. 90).

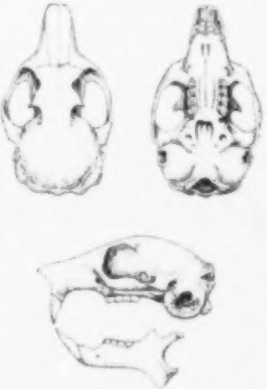
Glaucomys sabrinus (Northern Flying Squirrel)



DESCRIPTION: a medium-sized squirrel with a broad flat tail, large dark eyes bordered by a black ring, and a fold of skin that forms a gliding membrane extending along the sides between the wrist and ankle. The soft silky dorsal pelage varies from grey-brown to rich brown; the undersides, which are separated from the dorsal fur by a distinct dark lateral line, are pale with hairs that are grey at the base and whitish or tan at the tips. The skull has a distinct V-shaped notch in the interorbital region (Fig. 142), an inflated braincase, and postorbital processes that taper to a sharp point.

External measurements: TL= 322 (298–344) n=51, TV= 144 (130–164) n=51, HF= 42 (39–46) n=50, E= 21 (17–25) n=50, WT= 155.5 (124.0–200.6) n=58.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

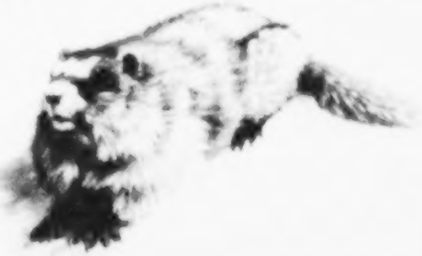


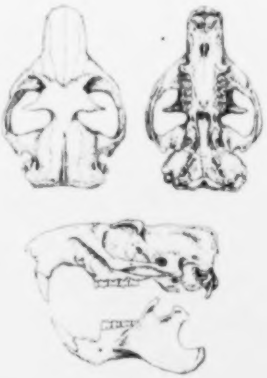
SIMILAR SPECIES: none.

RANGE: entire mainland and some coastal islands (but not Vancouver Island).

Marmota caligata (Hoary Marmot)

DESCRIPTION: a large marmot with a distinct dorsal pelage that is white to grey with a dark wash in the shoulder region giving it a mantled appearance. The head has a white nose and black cap that extends to the side of the face; the dorsal surfaces of the hind feet are black. Melanic individuals occur in some coastal populations. The posterior pad on the sole of the hind foot is circular in shape (Fig. 40). The skull is straight in dorsal profile (Fig. 132) with a distinct depression in the interorbital region. The postorbital processes are oriented at right angles to the main axis of skull (Fig. 133); the posterior border of the nasal bones is square or arched (Fig. 137).

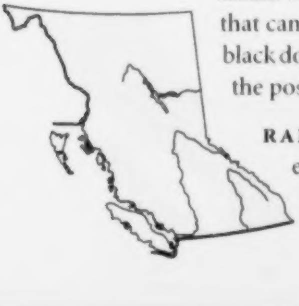




External measurements: TL= 673 (505–800) n=102, TV= 199 (140–246) n=106, HF= 94 (78–112) n=101, E= 26 (19–32) n=11, WT= 4.59 kg (3.09–5.59) n=6.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

SIMILAR SPECIES: the Yellow-bellied Marmot (*Marmota flaviventris*) and Woodchuck (*Marmota monax*) lack the hoary colour pattern and have smaller skulls (maxillary toothrow length <21.2 mm). Melanic individuals of these species can be identified by the oval posterior pad on the sole of the hind foot (Fig. 39). Its distribution does not overlap with the Vancouver Island Marmot (*Marmota vancouverensis*), a species that can be discriminated by its dark brown to nearly black dorsal pelage and skull with a V-shaped notch on the posterior border of the nasal bones (Fig. 136).



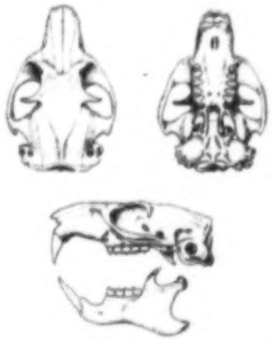
RANGE: higher elevations throughout the entire mainland; not known to occur on any British Columbian island.

Marmota flaviventris (Yellow-bellied Marmot)

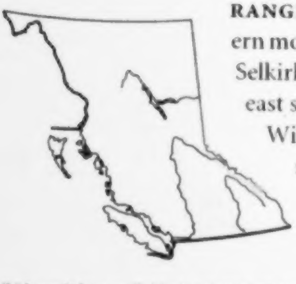
DESCRIPTION: a small marmot with a brown dorsal pelage that is grizzled with tan and grey. The ventral pelage is tan to yellow. The head is black with a white or tan area in front of eyes. The side of the neck is a uniform pale yellow or tan that contrasts from the sides and back. The dorsal surface of the hind feet are yellow to tan. The posterior pad on sole of the hind foot is oval in shape (Fig. 39). The skull is straight in dorsal profile with a distinct depression in the interorbital region; the postorbital processes are positioned at right angles to the main axis of the skull. The posterior border of the nasal bones forms an arch (Fig. 137) and the upper toothrows diverge anteriorly.

External measurements: TL= 517 (415–660) n=37, TV= 147 (103–184) n=39, HF= 72 (63–83) n=38, E= 27 (23–33) n=4, WT[28]= 1.5–3.7 kg n=9

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3



SIMILAR SPECIES: to discriminate from *M. caligata* see that account. Its range is mostly separate from that of the Woodchuck (*Marmota monax*) but the two marmots may co-occur in the Chilcotin and northern Fraser River valley region. *M. monax* lacks the white markings on the face and light patches on the side of the neck; its ventral fur is reddish-brown, and the dorsal surface of its feet are dark brown. The skull of *M. monax* has parallel upper toothrows and the posterior borders of the nasal bones form a V-shaped notch (Fig. 136).



RANGE: the Fraser and Thompson Plateaus, and southern mountains including the Cascade, Monashee, and Selkirk mountains. Western limits of the range are the east side of the Fraser River; northern limits are the Williams Lake area although an historical museum specimen was taken in the 1950s near Prince George.

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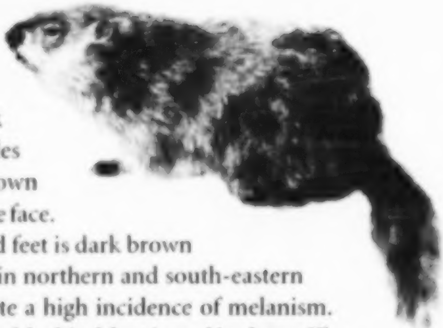
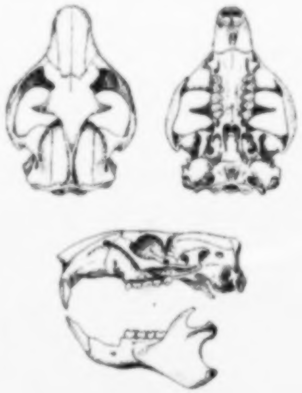
[28] No weights available for British Columbian populations, taken from Verts and Carraway (1998).

Marmota monax (Woodchuck)



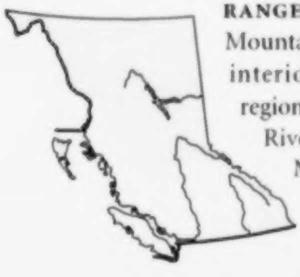
DESCRIPTION: a small marmot with brown dorsal fur grizzled with silver grey and reddish-brown ventral pelage. The side of the neck does not contrast from the sides and back. The head is dark brown with no white markings on the face. The dorsal surface of the hind feet is dark brown to nearly black. Populations in northern and south-eastern British Columbia demonstrate a high incidence of melanism. The posterior pad on the sole of the hind foot is oval in shape. The skull is straight in dorsal profile with a distinct depression in the interorbital region; the postorbital processes are at right angles to the main axis of the skull. The posterior border of the nasal bones forms a V-shaped notch (Fig. 136); the upper toothrows are parallel.



External measurements: TL= 496 (388–597) n=45, TV= 126 (98–171) n=44, HF= 72 (58–81) n=49, E= 28 (25–31) n=5, WT= 1.59 kg (1.06–2.40) n=7.

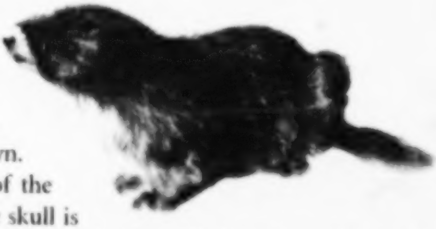
Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

SIMILAR SPECIES: Hoary Marmot (*M. caligata*) and Yellow-bellied Marmot (*M. flaviventris*); see those accounts for distinguishing traits.



RANGE: the Columbia Mountains, southern Rocky Mountains and most of the central and northern interior. It is generally absent from coastal regions, although there are records from the Skeena River and Stikine River valleys in the Coast Mountains.

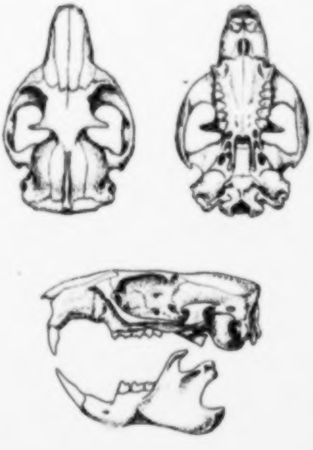
Marmota vancouverensis
(Vancouver Island Marmot)



DESCRIPTION: a large marmot with grizzled brown to black pelage, a white nose, and white markings on the forehead, chin and belly. Old faded fur is much paler ranging from tan to light brown. The posterior pad on the sole of the hind foot is round in shape. The skull is straight in dorsal profile, the interorbital region has a distinct depression, and the postorbital processes are at right angles to the main axis of the skull. The posterior border of the nasal bones forms a V-shaped notch (Fig. 136).

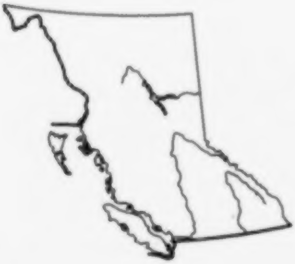
External measurements: TL= 668 (580–750) n=23, TV= 200 (162–300) n=23, HF= 97 (80–105) n=22, E= 29 (24–35) n=13, WT= 3.76 kg (3.20–4.40) n=3.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

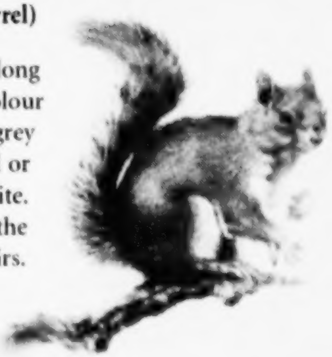


SIMILAR SPECIES: the fur colour resembles that of melanic hoary marmots (*M. caligata*) but the two species do not overlap in their distributions.

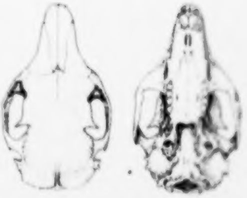
RANGE: confined to south-central Vancouver Island.

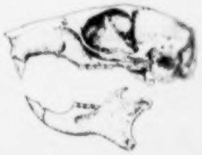


Sciurus carolinensis (Eastern Grey Squirrel)



DESCRIPTION: a large tree squirrel with a long bushy tail that exhibits three distinct colour phases: grey, intermediate, and black. The grey morph has a grey dorsal pelage with a red or cinnamon tinge; the ventral pelage is white. There are patches of white hairs behind the ears, and the tail is edged with long white hairs. The intermediate and black morphs are two forms of melanism with the black morph pure black and the intermediate morph a brownish colour that results from reddish-brown or blonde bands in the fur. All three colour morphs occur in south-western British Columbia with melanism (black, intermediate morphs) the dominant pelage colour in the lower Fraser Valley population, whereas the south-eastern Vancouver Island population consists almost entirely of the grey morph. The skull has parallel zygomatic arches that are not flattened in a horizontal plane (Fig. 141); the ventral border of the orbit is opposite the first upper molar (Fig. 143). Most individuals have two upper premolars but the first tiny peg-like premolar may be missing in some individuals.

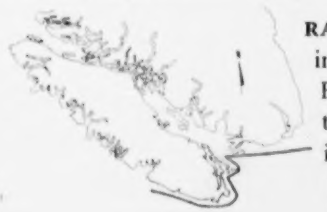




External measurements: TL= 476 (425–526) n=21, TV= 216 (186–250) n=21, HF= 67 (60–72) n=22, E= 28 (23–32) n=19, WT= 534.8 g (309.3–700.6) n=21.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

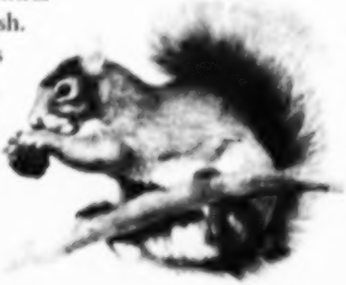
SIMILAR SPECIES: although it resembles the Fox Squirrel (*Sciurus niger*), another introduced species, distributions of the two species are widely separated in British Columbia. *S. niger* is distinguished by its yellow-orange ventral pelage, reddish-orange ear tufts; one pair of upper premolars.



RANGE: there are two introduced populations in the province. A population in the lower Fraser valley originated from an introduction to Stanley Park in the 1920s and a population in the Victoria region of Vancouver Island that was introduced in the 1960s.

Sciurus niger (Eastern Fox Squirrel)

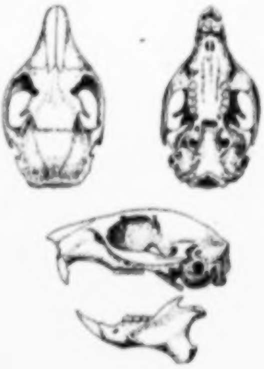
DESCRIPTION: a large tree squirrel with a long bushy tail. Many colour morphs occur in eastern North America, but only the typical colour morph with a grey dorsal pelage washed with light orange or tan occurs in British Columbia. The ventral pelage is whitish with a pale orange wash. There are patches of orange or tan hairs behind the ears. The dorsal surface of the tail has tricoloured hairs that are tan at their base, black in their mid section, and orange at the distal end. The underside of the tail is deep orange. The skull has parallel zygomatic arches that are not flattened in a horizontal plane; the ventral border of the orbit is opposite first upper molar.

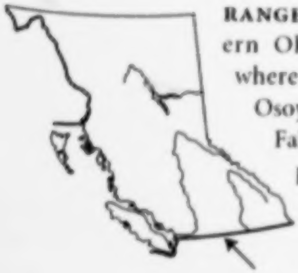


External measurements: TL= 454 (417–480) n=3, TV= 203 (201–204) n=3, HF= 65 (62–67) n=3, E= 22 (18–27) n=3, WT= 529.8 (529.6–530.0) n=2.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3

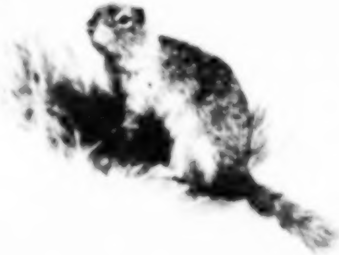
SIMILAR SPECIES: the Eastern Gray Squirrel (*S. carolinensis*); see that account for distinguishing traits.





RANGE: extreme southern Okanagan Valley where it ranges from Osoyoos to Okanagan Falls. This population presumably originated from populations introduced to Washington State.

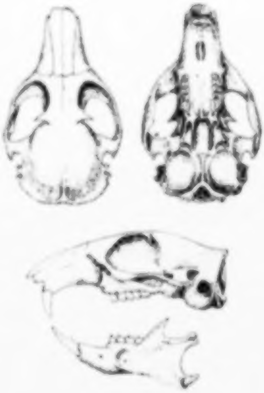
Spermophilus columbianus (Columbian Ground Squirrel)



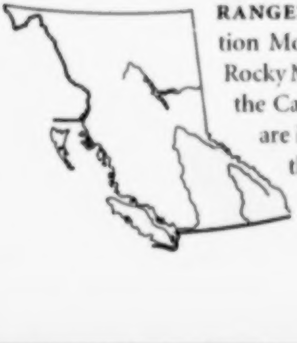
DESCRIPTION: the dorsal fur is grey washed with brown, and has a spotted or mottled pattern with brownish spots. The side of the neck is greyish, and the nose and front of the head are orange-brown. The underside of the tail is a mix of black and white. The hind legs and dorsal surface of the feet are reddish-brown. The skull is convex in dorsal profile (Fig. 134), with the zygomatic arches converging anteriorly in a horizontal plane (Fig. 140).

External measurements: TL= 341 (280–395) n=164, TV= 97 (78–120) n=161, HF= 51 (42–59) n=163, E= 16 (10–24) n=52, WT= 421.4 g (195.0–625.0) n=35.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

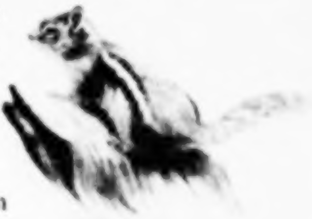


SIMILAR SPECIES: the only other British Columbia ground squirrel with similar pelage colour and markings and skull morphology is the Arctic Ground Squirrel (*Spermophilus parryii*). Their ranges are separated by about 300 kilometres in British Columbia. Nevertheless, *S. parryii* can be discriminated by paler fur on the side of its neck and undersides of the tail and white spots in the mid dorsal area white. Skulls of the two species overlap considerably in size and they cannot be discriminated by any single measurement.

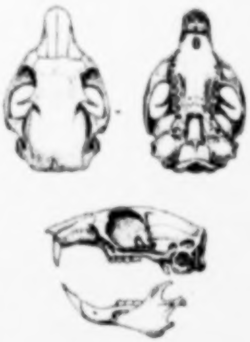


RANGE: the southern interior as far north as Intersection Mountain north of the Yellowhead Pass in the Rocky Mountains and Bowron Lake Provincial Park in the Cariboo Mountains. Western limits of its range are in the Cascade Mountains, and the east side of the Fraser River in the dry interior.

Spermophilus lateralis (Golden-mantled Ground Squirrel)



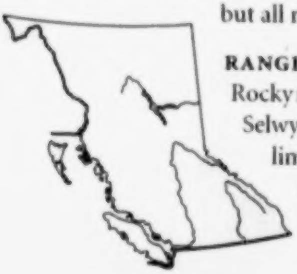
DESCRIPTION: the dorsal pelage has two longitudinal white stripes, each bordered by a pair of black stripes. The four dark stripes are complete and contrast sharply with the white stripes (Fig. 37). The stripes do not extend onto the head. A conspicuous rusty-red mantle is usually present on the head and shoulders, although in some individuals it may be indistinct. The ventral pelage is creamy white. The underside of the tail is pale yellow; the dorsal surface of the hind feet is pale yellow to nearly white. The skull is convex in dorsal profile; the zygomatic arches converge anteriorly in a horizontal plane .



External measurements: TL= 268 (171–360) n=114, TV= 97 (70–132) n=113, HF= 43 (35–55) n=114, E= 17 (12–23) n=30, WT= 196.8 g (165.0–216.7) n=10.

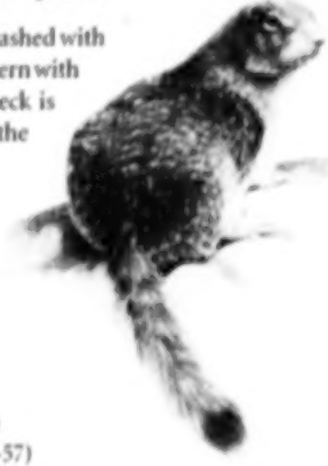
Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

SIMILAR SPECIES: chipmunks (*Tamias*) have five dark stripes and four light stripes , their body stripes extend onto the head, and they are smaller (skull length <40.0 mm, maxillary toothrow length <7.0 mm). The Columbian Ground Squirrel (*S. columbianus*) and Arctic Ground Squirrel (*S. parryii*) are mottled with no stripes and have larger skulls (skull length >49.0 mm, maxillary toothrow length >10.0 mm). Although their distributions are not known to overlap in British Columbia, this species is similar to the Cascade Mantled Ground Squirrel (*Spermophilus saturatus*). Externally, *S. saturatus* can be discriminated by: darker and duller pelage than *S. lateralis*, a dull indistinct mantle, a poorly defined inner-most dark stripe, and dark stripes that do not contrast sharply from the whitish stripe. The skull of *S. saturatus* averages slightly larger than that of *S. lateralis* but all measurements overlap among the two species.



RANGE: the Monashee, Selkirk, Purcell, Cariboo, and Rocky mountains where it ranges as far north as Mount Selwyn and Bowron Lakes Provincial Park. Western limits of its range are the Okanagan Valley on the east side of Okanagan Lake.

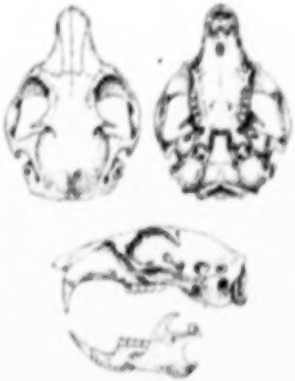
Spermophilus parryii (Arctic Ground Squirrel)



DESCRIPTION: the dorsal fur is grey washed with brown, and has a spotted or mottled pattern with whitish or tan spots. The side of the neck is tawny brown; the nose and front of the head is orange-brown. The underside of the tail is reddish with a black tip; the hind legs and dorsal surface of the feet are grey to yellowish-brown. The skull is convex in dorsal profile; the zygomatic arches converge anteriorly in a horizontal plane.

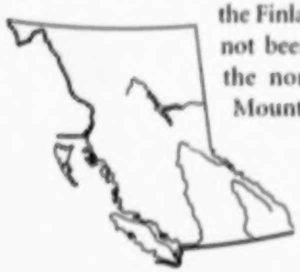
External measurements: TL= 332 (300–375) n=84, TV= 87 (72–111) n=99, HF= 52 (45–57) n=96, E= 15 (9–18) n=8, WT= 462.8 g (350.0–557.0) n=14.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

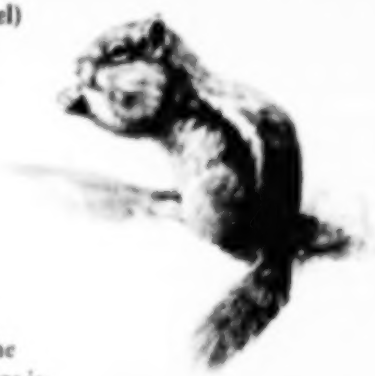


SIMILAR SPECIES: see the account for the Columbian Ground Squirrel (*S. columbianus*).

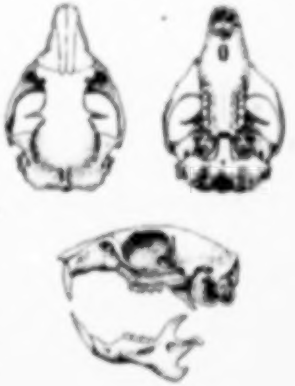
RANGE: north-western British Columbia from the Haines Triangle through the Cassiar Mountains and the Skeena Mountains as far south as Tatlatui Lake near the headwaters of the Finlay River. It has not been recorded in the northern Rocky Mountains.



Spermophilus saturatus
(Cascade Mantled Ground Squirrel)



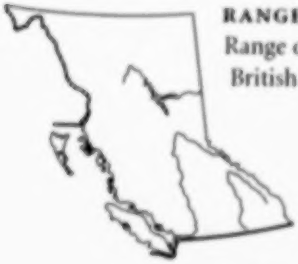
DESCRIPTION: the dorsal pelage has two longitudinal white or tan stripes, each bordered by a pair of indistinct black stripes. The body stripes do not extend onto the head. A dull, poorly defined mantle of brown or reddish fur is present on the head and shoulders (Fig.38). In some individuals the mantle is absent. The ventral pelage is tan or pale brown. The dorsal surface of the hind feet are tan; the underside of the tail is yellow to light orange. The skull is convex in dorsal profile; the zygomatic arches converge anteriorly in a horizontal plane.



External measurements: TL= 300 (253–320) n=30, TV= 103 (89–115) n=29, HF= 46 (40–53) n=30, E= 22 (21–23) n=3, WT= 245.0 g (162.0–314.0) n=3.

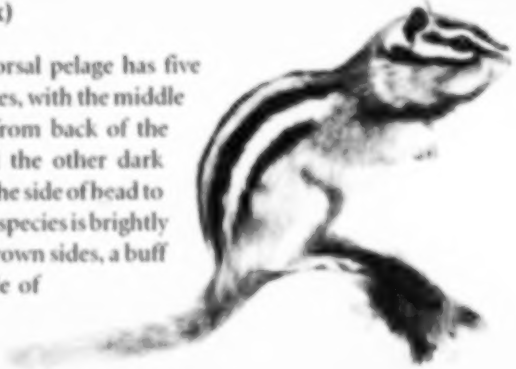
Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

SIMILAR SPECIES: closely resembles the Golden-mantled Ground Squirrel (S. *lateralis*); see its account for diagnostic traits.



RANGE: the Cascade Range of southwestern British Columbia.

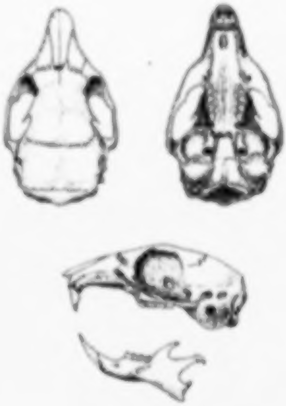
Tamias amoenus
(Yellow-pine Chipmunk)



DESCRIPTION: the dorsal pelage has five dark and four light stripes, with the middle dark stripe extending from back of the head to the rump and the other dark stripes extending from the side of head to the rump. Typically this species is brightly coloured with yellow-brown sides, a buff belly, and the underside of the tail yellow to orange. However, *T. amoenus* is the most variable of any of our chipmunks, and the five subspecies found in the province demonstrate pronounced colour variation, ranging from rich brown in coastal forms (*T. a. felix*) to pale grey in the dry interior (*T. a. affinis*). The skull has a simple rounded infraorbital opening piercing the zygomatic plate (Fig. 138). The baculum is small (shaft length 2.2 to 2.7 mm) with a tip length more than 30% of the shaft length. The baubellum is small (greatest length 1.0 to 1.8 mm) with a short indistinct base that may be notched in some specimens (Fig. 148).

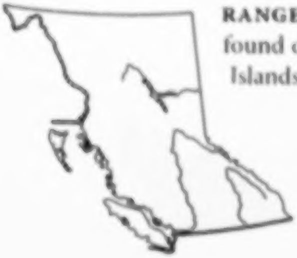
External measurements: TL= 213 (198–230) n=58, TV= 94 (79–110) n=58, HF= 32 (28–34) n=61, E=16 (11–18) n=47, WT= 55.0 (42.0–77.0) n=50.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3



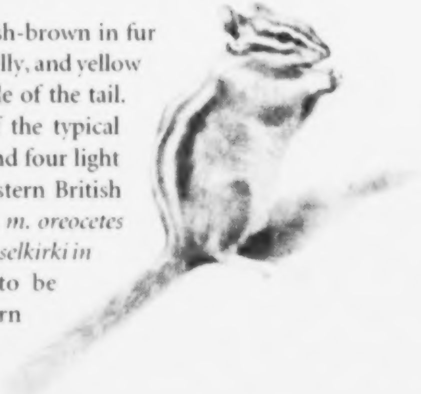
SIMILAR SPECIES: the distribution overlaps with the three other chipmunks in British Columbia: Least Chipmunk (*Tamias minimus*), Red-tailed Chipmunk (*Tamias ruficaudus*), and Townsend's Chipmunk (*Tamias townsendii*). *T. townsendii* is easily distinguished by its dull, indistinct light stripes, frosted tail, and larger size (body length > 130 mm, skull length > 37.0 mm, maxillary toothrow length > 6.0 mm).

In the Purcell Mountains and southern Rocky Mountains of south-eastern British Columbia, *T. minimus* is smaller (total length less <195 mm, skull length < 32.5 mm, mandibular length <17.5 mm) and it has a white or grey belly. But, in central British Columbia where *T. minimus* approaches *T. amoenus* in size and some *T. amoenus* have a white belly, positive identification can only be made from genital bone morphology. Although the Rocky Mountain population of the Red-tailed Chipmunk (*T. r. ruficaudus*) is generally larger and is more rufous on the neck, sides and underside of the tail than *T. amoenus*, size and pelage traits are not completely reliable, particularly for identifying immature animals. In the Selkirk Mountains, where *T. amoenus* and *T. ruficaudus* converge in size and pelage colour, positive identification can only be made from the genital bones.

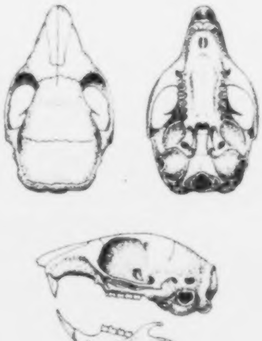


RANGE: southern and central British Columbia; not found on Vancouver Island or the Queen Charlotte Islands.

Tamias minimus (Least Chipmunk)



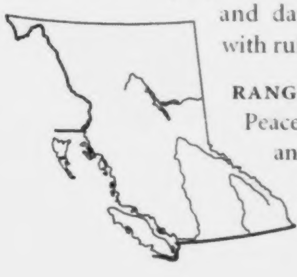
DESCRIPTION: generally greyish-brown in fur colour with a grey rump, white belly, and yellow on the neck, sides, and underside of the tail. The striping pattern consists of the typical chipmunk pattern of five dark and four light stripes. Populations in south-eastern British Columbia (i.e., the subspecies *T. m. oreocetes* in the southern Rockies and *T. m. selkirki in the* Purcell Mountains) tend to be smaller and paler than northern populations. The skull has a simple rounded infraorbital opening piercing the zygomatic plate; it is the smallest skull of any chipmunk in the province. The baculum is small (shaft length 2.6 to 2.9 mm) with a tip that is less than 30% of the shaft length). The baubellum is small (greatest length 0.9 to 1.1 mm) with a distinct "U" shaped base that tapers sharply at its proximal end (Fig. 147).



External measurements: TL= 198 (172–222) n=78, TV= 87 (69–101) n=79, HF= 31 (27–34) n=85, E= 13 (10–16) n=75, WT=45.5 (36.0–62.0) n=76.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

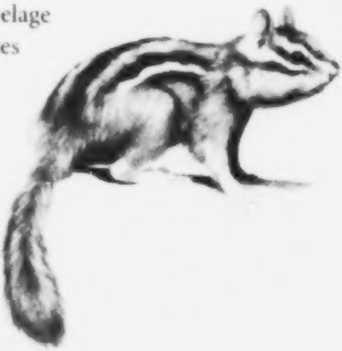
SIMILAR SPECIES: its distribution overlaps with *T. amoenus* and *T. ruficaudus*. See the account for *T. amoenus* for diagnostic traits. *T. ruficaudus* is easily discriminated by its larger size (total length greater than 205 mm; skull length greater than 34.0 mm) and darker pelage with rufous on the sides and underside of the tail.



RANGE: northern British Columbia south to the Peace River and Babine Lake region. In central and southern parts of the province it is restricted to the Rocky Mountains and the Purcell Mountains.

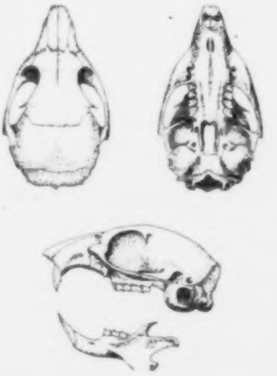
Tamias ruficaudus (Red-tailed Chipmunk)

DESCRIPTION: a large chipmunk with the typical striping pattern of five dark and four light stripes. Size and pelage varies strikingly among the two subspecies. The Rocky Mountain population (i.e., *T. r. ruficaudus*) has bright reddish pelage on the underside of the tail and the sides and back of the head are washed with yellow. In contrast, the Selkirk Mountains form (i.e., *T. r. simulans*) is paler with tan or yellow fur on the underside of the tail. The skull has a simple rounded infraorbital opening piercing the zygomatic plate. The baculum and baubellum are large and robust (shaft length of the baculum 3.4 to 4.7 mm, greatest length of the baubellum 2.0 to 3.2 mm).

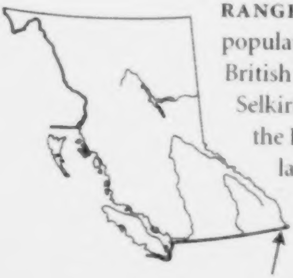


External measurements: TL= 223 (207–237) n=47, TV= 991 (89–115) n=46, HF= 33 (30–35) n=46, E= 17 (13–19) n=37, WT=59.5 g (44.2–78.7) n=37.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

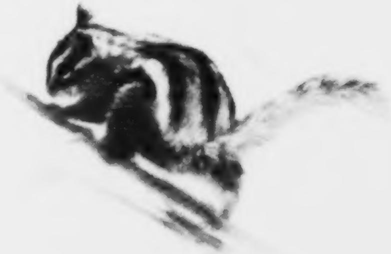


SIMILAR SPECIES: see accounts for the Yellow-pine Chipmunk (T. *amoenus*) and Least Chipmunk (*T. minimus*) for identification problems.

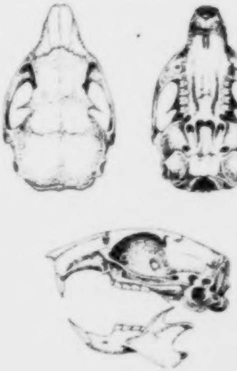


RANGE: two disjunct populations occur in British Columbia. One is restricted to the southern Selkirk Mountains where its range is delimited by the Kootenay and Columbia rivers. Another population inhabits the southern Rocky Mountains ranging from the Akamina Pass-Wall Lake area as far north as Middle Kootenay Pass.

Tamias townsendii (Townsend's Chipmunk)



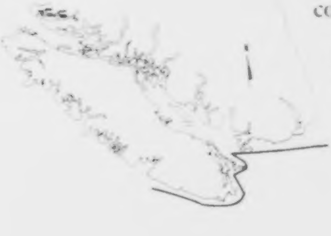
DESCRIPTION: a large chipmunk with a rich brown pelage and the typical chipmunk striping pattern although the four light stripes tend to be indistinct. White or grey patches occur behind the ears. The fur on the dorsal surface of the tail has a frosted appearance resulting from black hairs tipped with silver-grey. The colour varies geographically, with the coastal subspecies (*T. t. townsendii*) very dark with indistinct light stripes and the Cascade Mountain subspecies (*T. t. cooperi*) paler with the light stripes contrasting more with the dark stripes. The skull has a simple rounded infraorbital opening piercing the zygomatic plate; it is the largest skull of any British Columbia chipmunk. The baculum is small (shaft length 2.2 to 2.6 mm) with the tip length more than 30% of the shaft length. The baubellum is small (greatest length about 1.0 mm) with a "U" shaped base that tapers sharply at its proximal end.



External measurements: TL= 260 (234–286) n=43, TV= 114 (103–130) n=43, HF= 36 (32–40) n=42, E= 19 (17–23) n=12, WT= 77.8 (65.2–89.0) n=11.

Dental Formula: incisors 1/1, canines 0/0, premolars 2/1, molars 3/3

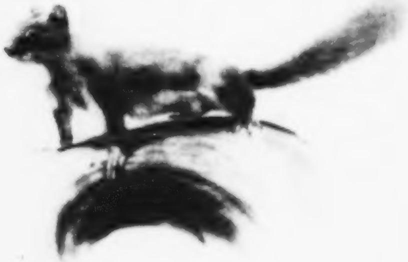
SIMILAR SPECIES: *T. amoenus* is the only chipmunk species that overlaps with the range of *T. townsendii*; see that account for diagnostic traits.



RANGE: extreme southwestern British Columbia in the lower Fraser Valley and Cascade Range east to Allison Pass and Treasure Mountain.

Tamiasciurus douglasii (Douglas' Squirrel)

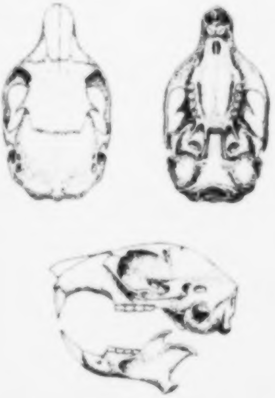
DESCRIPTION: a small tree squirrel with an olive-brown dorsal pelage and ventral pelage that ranges from pale yellow to orange. The tail hairs are tipped with white or pale yellow. The skull has the infraorbital opening modified as a canal that passes between the zygomatic plate and the side of the rostrum (Fig. 139), the zygomatic arches are parallel and not flattened in a horizontal plane (Fig. 141). The anterior border of the orbit is opposite the second upper premolar (Fig. 143).

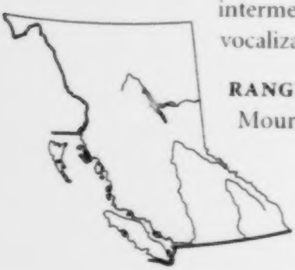


External measurements: TL= 308 (271–351) n=144, TV= 122 (90–150) n=144, HF= 49 (44–57) n=125, E= 26 (20–31) n=151, WT= 203.5 g (157.4–270.6) n=154.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3

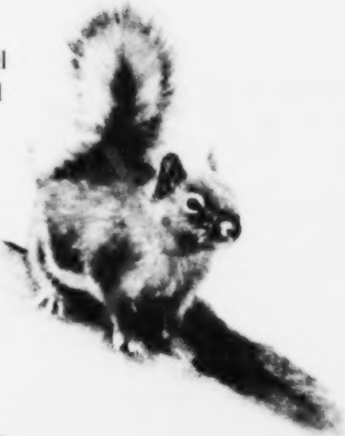
SIMILAR SPECIES: the only similar species is the Red Squirrel (*Tamiasciurus hudsonicus*) which overlaps with *T. douglasii* along the crest of the Cascades and southern Coast Mountains. *T. hudsonicus* is generally discriminated by its grey to olive-brown dorsal pelage, white to grey belly, and tail hairs tipped with red. Although *T. hudsonicus* is larger, the two species overlap extensively in their skull and body measurements. Identification is problematic in parts of the Cascade Mountains (Manning Provincial Park, Fraser River canyon) where some squirrels appear intermediate in pelage, vocalizations, and skull morphology (see Smith 1981).





RANGE: Fraser Valley, Cascade Range and the Coast Mountains north to Rivers Inlet.

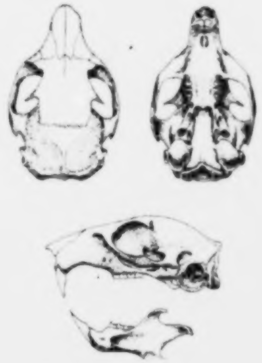
Tamiasciurus hudsonicus
(Red Squirrel)



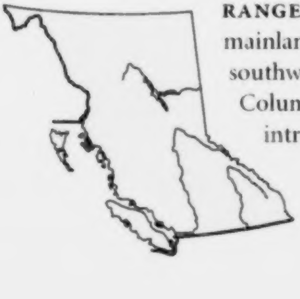
DESCRIPTION: a small tree squirrel with an olive-brown dorsal pelage and undersides that range from white to grey. The tail hairs are tipped with red. The skull has an infraorbital opening modified as a canal that passes between the zygomatic plate and the side of the rostrum. The zygomatic arches are parallel and not flattened in a horizontal plane; the anterior border of the orbit is opposite the second upper premolar.

External measurements: TL= 318 (192–363) n=342, TV= 125 (99–150) n=342, HF= 49 (32–57) n=328, E= 25 (14–32) n=328, WT= 224.5 (147.8–295.2) n=365.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3



SIMILAR SPECIES: in some parts of the Cascades and Coast Mountains can be confused with T. *douglasii;* see that account for diagnostic traits.



RANGE: the entire mainland excluding southwestern British Columbia and Vancouver Island; introduced to the Queen Charlotte Islands.

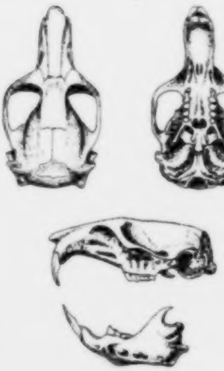
FAMILY GEOMYIDAE: POCKET GOPHERS

Thomomys talpoides
(Northern Pocket Gopher)

DESCRIPTION: a chipmunk-sized rodent with a thickset body, short legs and tail, and small eyes and ears. The front feet have five strong claws. Two fur-lined cheek pouches extend from the face to the shoulder area (Fig. 41). The dorsal pelage is generally brown, although melanic individuals occur in some populations. Some populations have prominent white markings on the chin, forearms, and abdomen. The skull is flattened with wide zygomatic arches and an infraorbital foramen positioned on the side of the rostrum in front of the zygomatic plate. The upper and lower premolars are indented on the side forming an "8" shape (Fig. 130).

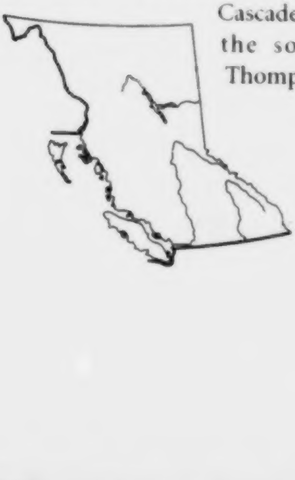
External measurements: TL= 199 (154–230) n=413, TV= 26 (22–36) n=228, HF=26 (22–36) n=228, E= 5 (4–7) n=17, WT= 90.7 g (69.1–113.0) n=24 males; 83.2 g (60.8–116.4) n=31 females.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3



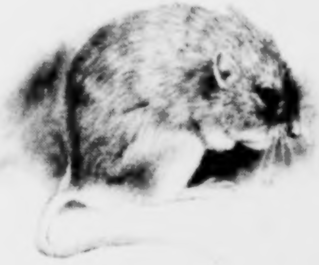
SIMILAR SPECIES: none.

RANGE: southern interior of British Columbia from the east Kootenays to the east slopes of the Cascade Range and north to the south side of the Thompson River.



FAMILY HETEROMYIDAE: HETEROMYIDS

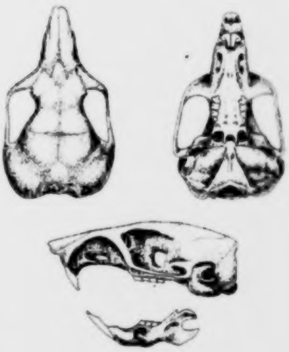
Perognathus parvus
(Great Basin Pocket Mouse)



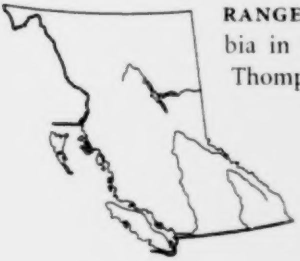
DESCRIPTION: a 'mouse-like' rodent with a long tail (greater than head and body length), small ears, and external fur-lined cheek pouches. The dorsal pelage is dull grey-brown and the undersides are white. The skull has a large circular infraorbital opening on the side of the rostrum (Fig. 91), and slender zygomatic arches. The incisors are thin and compressed.

External measurements: TL= 175 (151–202) n=241, TV= 93 (77–112) n=238, HF= 23 (20–27) n=237, E= 6 (4–10) n=55, WT= 19.7 g (16.0–28.0) n=32.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3



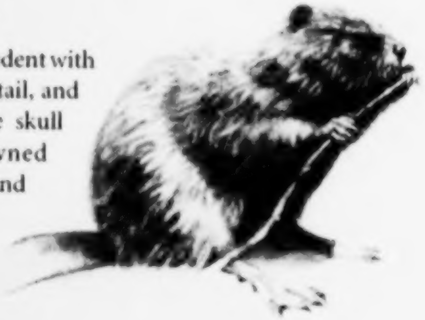
SIMILAR SPECIES: the Deer Mouse (*Peromyscus maniculatus*) is the only rodent that could be confused with this species. *P. maniculatus* has larger ears, a shorter tail, and no cheek pouches; its skull has a V-shaped infraorbital opening at the base of the zygomatic arch (Fig. 92) and only three pairs of cheek teeth (no premolars).



RANGE: the dry interior grasslands of British Columbia in the Okanagan, Similkameen, Kettle, and Thompson valleys.

FAMILY CASTORIDAE: BEAVERS

Castor canadensis (Beaver)



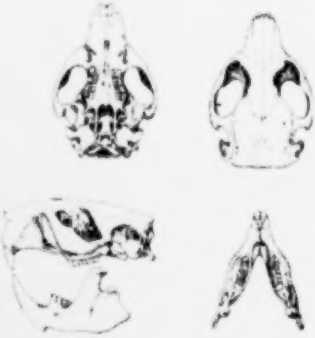
DESCRIPTION: our largest rodent with webbed hind feet, a flat scaly tail, and long glossy guard hairs. The skull is massive with high crowned cheek teeth, large incisors, and a prominent depression in the basioccipital region (Fig. 131).

External measurements:
TL= 1041 (900–1212) n=58, TV= 297 (146–500) n=54, HF= 175 (146–200) n=57, E= 35 (30–44) n=41, WT= 19.2 kg (11.6–35.3) n=43.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3

SIMILAR SPECIES: none.

RANGE: the entire mainland and many coastal islands including Vancouver Island; introduced to the Queen Charlotte Islands.



FAMILY MURIDAE: RATS, MICE, VOLES, LEMMINGS

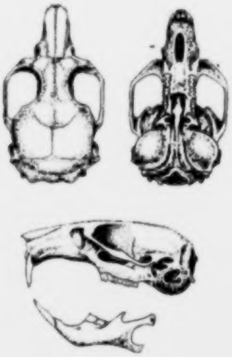
Although their external appearance is variable most species tend to be 'mouse or rat-like'; the skull has three upper and three lower pairs of cheek teeth and a V-shaped infraorbital foramen (Fig. 92). Three subfamilies are represented in British Columbia.

SUBFAMILY ARVICOLINAE: VOLES AND LEMMINGS

Stocky rodents with a blunt muzzle, small eyes and ears, relatively short legs, and a tail that is usually shorter than the head and body length (Fig. 43). The skull is angular in profile. The crowns of the molars have prisms arranged in alternating triangles (Fig. 88). In the Muskrat (*Ondatra zibethicus*), Red-backed Voles (*Clethrionomys*) and Heather Vole (*Phenacomys intermedius*) the molars are rooted; but are ever-growing in other species.

Clethrionomys gapperi (Southern Red-backed Vole)

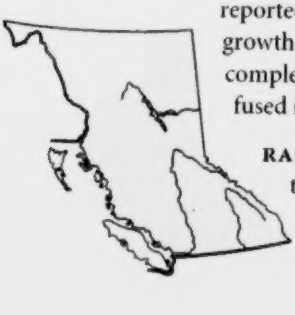
DESCRIPTION: a small vole with long and thick dorsal fur with a rufous-brown or chestnut median stripe that extends from the head to the rump. The ventral pelage is white to grey; the hind feet are dark grey or black washed with silver. The dorsal stripe may be inconspicuous in young animals. The tail, which is 22-32 % of the total length, is slender and sparsely furred with grey or white hairs on the ventral surface. A dark colour phase found in some northern populations has a grey or black dorsal stripe, grey sides, and a dark tail. The rounded delicate skull has small rooted cheek teeth and a palate that terminates posteriorly in a simple transverse shelf (Fig. 106) in which the posterior edge is usually completely fused (Fig. 108).



External measurements: TL= 133 (110–162) n=597, TV= 36 (22–55) n=596, HF= 18 (14–22) n=597, E= 14 (9–19) n=512, WT= 22.9 (15.0–45.0) n=597.

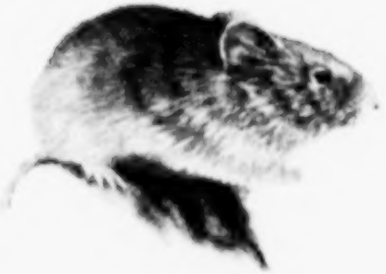
Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3

SIMILAR SPECIES: identification may be problematic in northern British Columbia where this species overlaps in its distribution with the Northern Red-backed Vole (*Clethrionomys rutilus*). Adult *C. rutilus* have a more densely furred and thicker tail that is yellow on the ventral surface. The skull of *C. rutilus* is discriminated from that of *C. gapperi* by a palate that is incompletely fused at its posterior edge (Fig. 109). Nevertheless, Bee and Hall (1956) reported that the fusion of the palate was related to growth and age. Some old adult *C. rutilus* may have complete palates and the palate may not be completely fused in some immature *C. gapperi*.



RANGE: found across most of the province except the extreme northwest where it is replaced by the Northern Red-backed Vole. It also occurs on several central coast islands.

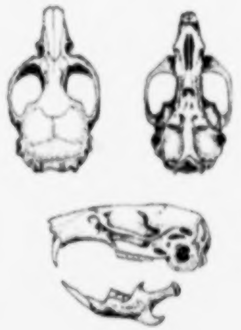
Clethrionomys rutilus
(Northern Red-backed Vole)



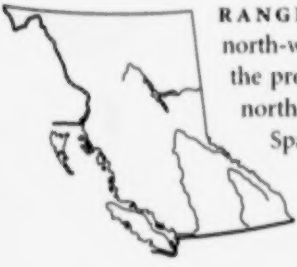
DESCRIPTION: a small vole with a rufous-brown or chestnut median stripe on its back. The dorsal fur is long and thick; the undersides are white to grey. The tail which is 19–30 % of the total length is thick and densely furred with yellow fur on its ventral surface. The skull has small rooted cheek teeth; the palate terminates posteriorly in a simple transverse shelf with the posterior edge of the palate incompletely fused (Fig. 109).

External measurements: TL= 129 (110–148) n=85, TV= 31 (21–41) n=104, HF= 19 (15–21) n=103, E= 14 (11–17) n=37, WT= 25.4 g (18.0–31.8) n=25.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3

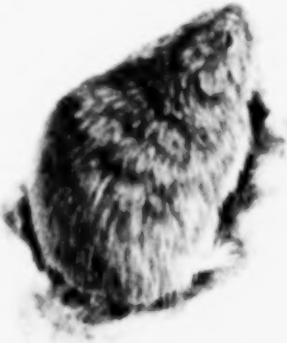


SIMILAR SPECIES: *C. rutilus* may be confused with the Southern Red-backed Vole (*C. gapperi*); see that account for identification.



RANGE: extreme north-western part of the province from the Haines Triangle east to the northern Rocky Mountains and as far south as Spatsizi Plateau.

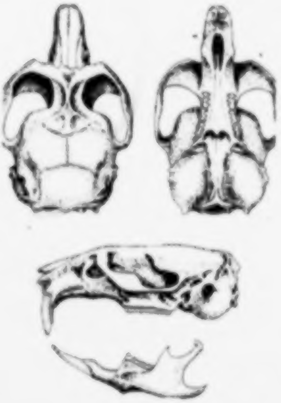
Lemmus trimucronatus (Brown Lemming)



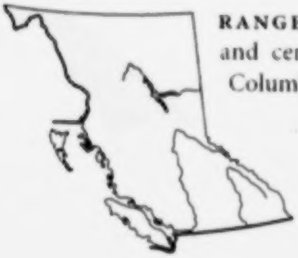
DESCRIPTION: a large stocky vole with long, soft fur; and bright orange-brown dorsal pelage. The tail is short (<20% of the total length), about the length of the hind foot. The ears and tail are nearly concealed in fur. The skull is massive with broadly divergent zygomatic arches. On the upper molars, the re-entrant angles are deeper on the outer side (Fig. 96), and in the first and second upper molars, the re-entrant angles extend to the inner border of the tooth.

External measurements: TL= 142 (122–170) n=48, TV= 17 (12–28) n=48, HF= 21 (19–24) n=47, E= 11 (9–14) n=23, WT= 65.1 g (42.5–98.4) n=10.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3

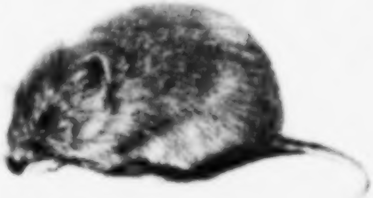


SIMILAR SPECIES: no other vole is similar in external appearance. Although the skull of the Northern Bog Lemming (*Synaptomys borealis*) has a similar enamel pattern in its upper molars, it can be discriminated by smaller size, a shorter rostrum, grooved upper incisors, and lower molars that lack closed triangles on the outer sides (Fig. 102).

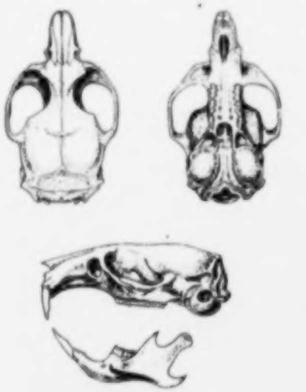


RANGE: northern and central British Columbia.

Microtus longicaudus (Long-tailed Vole)



DESCRIPTION: a medium-sized vole with a long tail 30 to 44% of its total length. The Goose Island population demonstrates gigantism with some adults more than 60 g. The dorsal pelage ranges from dull grey or reddish brown to nearly black in some coastal populations. The undersides are greyish. The skull is characterized by a broad incisive foramen with a sharply tapered anterior region, and incisors that do not protrude beyond the nasal bones when the skull is viewed dorsally (Fig. 118). The second upper molar lacks a posterior loop (Fig. 111), the third upper molar has four inner salient angles (Fig. 115), and the first lower molar has five or six closed triangles (Fig. 113).

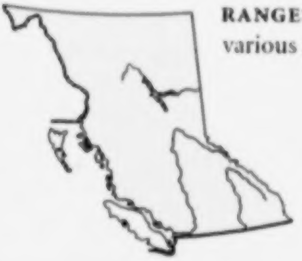


External measurements: TL= 182 (150–267) n=632, TV= 66 (50–90) n=622, HF= 21 (16–27) n=627, E= 13 (8–21) n=139, WT= 43.7 g (20.0–85.0) n=146.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

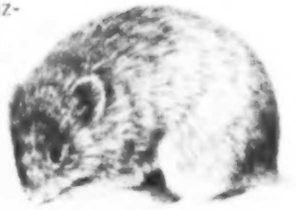
SIMILAR SPECIES: the distribution of *M. longicaudus* overlaps with six other *Microtus* species in British Columbia: Creeping Vole (*Microtus oregoni*), Meadow Vole (*Microtus pennsylvanicus*), Montane Vole (*Microtus montanus*), Townsend's Vole (*Microtus townsendii*), Tundra Vole (*Microtus oeconomus*), and Water Vole (*Microtus richardsoni*). In external appearance, *M. longicaudus* can be discriminated from most of these species by a relatively longer tail (tail length> 50 mm and usually >33% of the total length). *M. richardsoni* has a long tail but it can be distinguished from *M. longicaudus* by its longer foot (hind foot> 28 mm) and larger adult body size (weight >90 g).

The skulls of *M. oeconomus*, *M. pennsylvanicus*, and *M. oregoni* can be discriminated from *M. longicaudus* by their different molar enamel patterns (see those accounts). *M. richardsoni* has the same molar enamel patterns but its skull is much larger (maxillary toothrow length >7 mm). *M. montanus* and *M. townsendii* also share the same molar enamel patterns and their skulls are similar in size. Authorities such as Maser and Storm (1970) reported that these species differ from *M. longicaudus* in having incisors that protrude beyond the nasal bones when their skulls are viewed dorsally and incisive foramen are that are narrow and not tapered anteriorly. Nevertheless, these traits are variable and age-related; distinguishing their skulls from *M. longicaudus* is difficult.

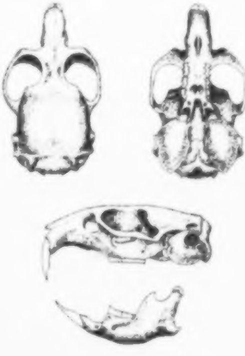


RANGE: the entire British Columbian mainland and various near shore coastal islands.

Microtus montanus (Montane Vole)



DESCRIPTION: a small vole with grizzled-grey or "salt and pepper" dorsal pelage; the undersides are grey to white. The fur on the dorsal surface of the feet is silver-grey. The tail is less than 30% of the total length and is bicoloured with grey to greyish-brown above and whitish underneath. The skull has a short incisive foramen tapered in the posterior region, and the incisors protrude slightly beyond the nasal bones when the skull is viewed in dorsal profile (Fig. 119). The second upper molar lacks a posterior loop (Fig. 111), the third upper molar has four inner salient angles (Fig. 115), and the first lower molar has five or six closed triangles (Fig. 113).

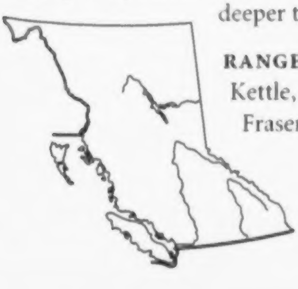


External measurements: TL= 142 (120–165) n=95, TV= 38 (29–51) n=95, HF= 18 (16–22) n=92, E= 12 (9–14) n=11, WT= 31.6 (22.0–45.0) n=14.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

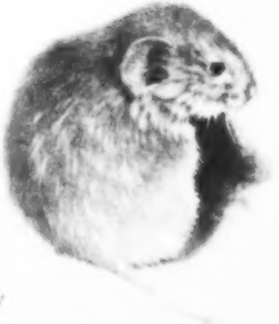
SIMILAR SPECIES: its distribution overlaps with the Meadow Vole (*M. pennsylvanicus*) and Long-tailed Vole (*M. longicaudus*) in British Columbia. It could also be confused with the Heather Vole (*P. intermedius*).

See previous account for diagnostic traits of *M. longicaudus*. *M. pennsylvanicus* lacks the grizzled salt and pepper pelage and the dorsal surfaces of its hind feet are darker. Its second upper molar has a distinct posterior loop (Fig. 110). *P. intermedius* has softer, finer fur, more brownish dorsal pelage, a thinner more sparsely furred tail, and lower molars with the inner re-entrant angles deeper than the outer re-entrant angles (Fig. 104).



RANGE: the dry interior grasslands including the Kettle, Similkameen, Okanagan, Thompson, and Fraser river valleys north to the Chilcotin.

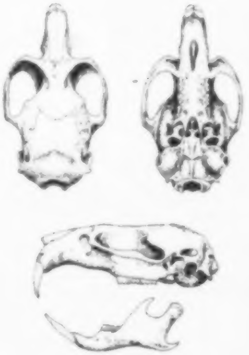
Microtus oeconomus (Tundra Vole)



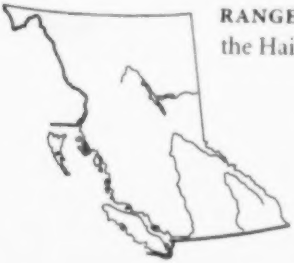
DESCRIPTION: the dorsal pelage has tinges of yellow on the flanks and rump; the undersides are buffy-yellow. The tail is short, less than 30% of the total length, and strongly bicoloured. The skull is characterized by the second upper molar lacking a posterior loop (Fig. 111) and the third upper molar having four inner salient angles (Fig. 115). The first lower molar usually has only four closed triangles (Fig. 112)-fewer than any other British Columbia species of *Microtus*.

External measurements: TL= 160 (133–179) n=48, TV= 37 (29–45) n=48, HF= 19 (17–22) n=47, E= 14 (12–16) n=27, WT= 53.0 g (36.1–69.0) n=23.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

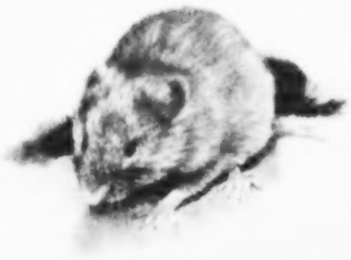


SIMILAR SPECIES: its distribution overlaps with the Meadow Vole (*M. pennsylvanicus*) and Long-tailed Vole (*M. longicaudus*) in northern British Columbia. See the *M. longicaudus* account for diagnostic traits. *M. pennsylvanicus* lacks the yellow on flanks and rump, has grey ventral pelage, and a tail that is not strongly bicoloured; its second upper molar has a posterior loop and the first lower molar has more than four closed triangles.

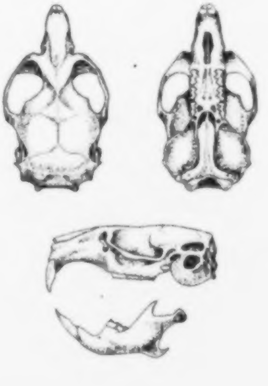


RANGE: extreme north-western British Columbia from the Haines Triangle east to the Cassiar Mountains.

Microtus oregoni (Creeping Vole)



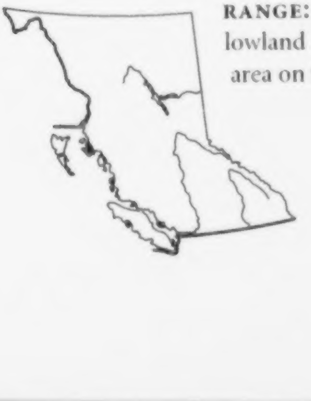
DESCRIPTION: our smallest species of *Microtus* (weight< 30 g), it has tiny eyes (less than 3 mm in diameter) and a short tail (< 30% of the total length). The fur is short, almost shrew-like. Although a number of authorities (Ingles 1965; Hall 1981) have noted that this species has only five pads on the sole of its hind foot (most species of *Microtus* have six), this trait needs to be confirmed in a large series of live animals or fresh specimens. The skull is characterized by the third upper molar with three inner salient angles (Fig. 114), a pattern found in no other British Columbian species of *Microtus*.



External measurements: TL= 135 (122–153) n=90, TV= 34 (28–42) n=90, HF= 18 (16–20) n=89, E= 10 (9–13) n=43, WT= 21.5 g (10.0–31.0) n=59.

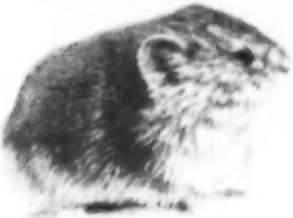
Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

SIMILAR SPECIES: in southwestern British Columbia this species co-occurs with *M. longicaudus*, *M. pennsylvanicus*, *M. richardsoni* and *M. townsendii*. Diagnostic traits for identifying *M. oregoni* include: short fur, small eye (<4 mm in diameter), and the third upper molar with only three inner salient angles.



RANGE: southwestern British Columbia in the Fraser lowland and Cascade Range east to the Allison Pass area on the east slopes of the Cascades.

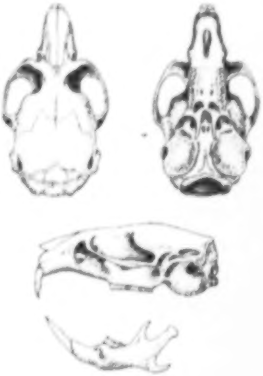
Microtus pennsylvanicus
(Meadow Vole)



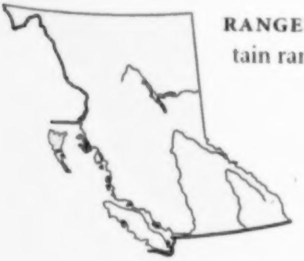
DESCRIPTION: the dorsal pelage colour is variable ranging from grey to brown; the undersides are grey to whitish. The tail is usually less than 30% of the total length (20-32%). The skull is characterized by: the second upper molar with a posterior loop (Fig. 110), a trait found in no other British Columbian species of *Microtus*, the third upper molar with four inner salient angles (Fig. 115), and the first lower molar with five or six closed triangles (Fig. 113).

External measurements: TL= 147 (120–186) n=251, TV= 38 (24–49) n=256, HF= 19 (16–26) n=259, E= 12 (7–17) n=218, WT= 34.9 (20.0-63.5) n=262.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

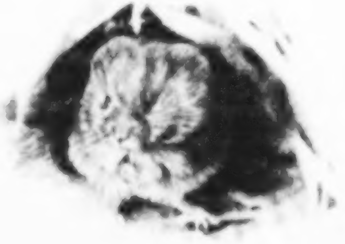


SIMILAR SPECIES: its distribution overlaps with five other *Microtus* species in British Columbia but it can only be confused with the Montane Vole (*M. montanus*), Tundra Vole (*M. oeconomus*), and Townsend's Vole (*M. townsendii*). See those species accounts for distinguishing external traits. The presence of a posterior loop on the second upper molar is diagnostic.

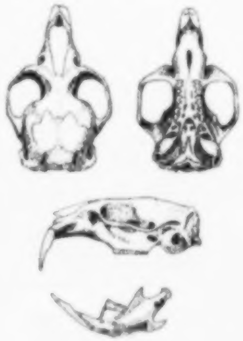


RANGE: entire mainland east of the coastal mountain ranges.

Microtus richardsoni
(Water Vole)



DESCRIPTION: our largest *Microtus* species, with a hind foot greater than 28 mm and an adult weight usually more than 90 grams. The dorsal pelage is dark grey or grizzled brown; the undersides are grey. The tail is long (> 50 mm, and 26-39% of the total length) and thick. Although authorities such as Ingles (1965) and Hall (1981) reported that the hind foot has only five pads on its sole, I have observed a small vestigal sixth pad on some specimens of this species. The skull is large (maxillary toothrow length >7 mm) with the incisive foramina long and tapered posteriorly (Fig. 117); the nasal bones protrude well beyond the incisors in dorsal view (Fig. 116). The second upper molar lacks a posterior loop (Fig. 111), the third upper molar has four inner salient angles (Fig. 115), and the first lower molar has five or six closed triangles (Fig. 113).



External measurements: TL= 239 (177–276) n=57, TV= 78 (54–98) n=56, HF= 29 (24–34) n=58, E= 14 (12–20) n=58, WT=151.2g (124.0–1777.3) n=12.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

SIMILAR SPECIES: its distribution overlaps with the Creeping Vole (*M. oregoni*), Meadow Vole (*M. pennsylvanicus*) and Long-tailed Vole (*M. longicaudus*) in British Columbia; see those accounts for diagnostic traits.

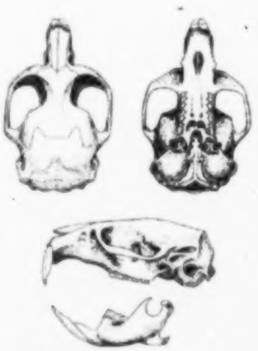
RANGE: there are two separate distributional areas in British Columbia: the Cascade and southern Coast mountains and the Columbia and Rocky mountains.

Microtus townsendii
(Townsend's Vole)

DESCRIPTION: a large *Microtus* with a hind foot usually greater than 21 mm, and a tail more than 50 mm. The Triangle Island population (*M. t. cowani*) demonstrates gigantism with some adults more than 100 g. The dorsal pelage is dark brown; the undersides are grey to white. The skull has a narrow incisive foramen that is not tapered anteriorly or posteriorly; the incisors protrude slightly beyond the nasal bones when the skull is viewed dorsally (Fig. 119). The second upper molar lacks a posterior loop (Fig. 111), the third upper molar has four inner salient angles (Fig. 115), and the first lower molar has five or six closed triangles (Fig. 113).

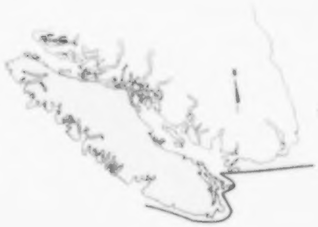
External measurements: TL= 192 (155–184) n= 142, TV= 58 (42–75) n=153 (19–29), E= 14 (10–18) n=65, WT= 59.6 g (40.0–103.0) n=89.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

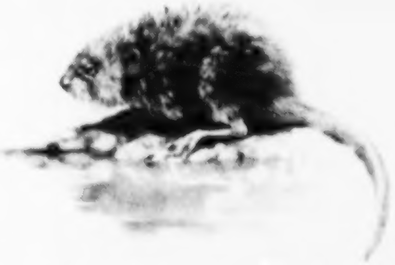


SIMILAR SPECIES: the distribution of *M. townsendii* overlaps with that of *M. longicaudus* and *M. oregoni* in the lower Fraser valley. See those accounts for diagnostic traits.

RANGE: Vancouver Island and various associated smaller islands and the lower Fraser River valley east to Chilliwack.

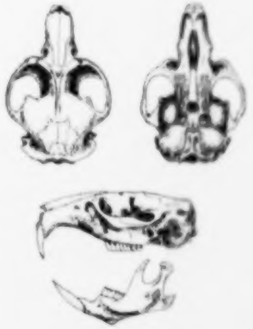


***Ondatra zibethicus* (Muskrat)**



DESCRIPTION: the largest vole in the province, it has large hind feet that are partially webbed with stiff hairs on their edges. The tail is scaly and flattened laterally The rich pelage has a short dense underfur with long, glossy guard hairs. The skull is large (skull length >40.0 mm, maxillary toothrow length >14.0 mm) with rooted cheek teeth.

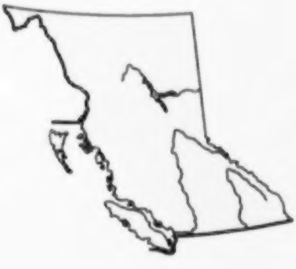
External measurements: TL= 547 (448–685) n=140, TV= 242 (195–295) n=138, HF= 76 (63–85) n=137, E= 23 (19–26) n=26, WT=1.02 kg (0.70–1.77) n=40.



Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

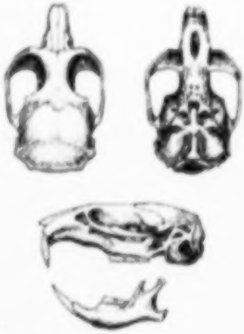
SIMILAR SPECIES: none.

RANGE: the entire mainland of the province; introduced to Vancouver Island and the Queen Charlotte Islands.



Phenacomys intermedius (Heather Vole)

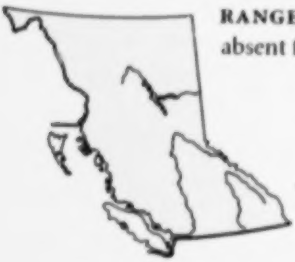
DESCRIPTION: a small vole with soft fine fur. The dorsal pelage ranges from brown to greyish-brown; undersides are grey or whitish. Some northern populations have a yellow wash on the nose. The dorsal surface of the hind feet is whitish. The tail is short (< 30% of the total length), thin (even at its base), and sparsely furred. The cheek teeth are rooted; the lower molars have inner re-entrant angles deeper than the outer re-entrant angles (Fig. 104).



External measurements: TL= 137 (120–164) n=82, TV= 33 (21–46) n=84, HF= 18 (15–22) n=83, E= 14 (10–16) n=24, WT= 32.1 g (24.0–50.0) n=21.

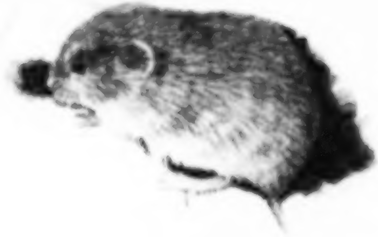
Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

SIMILAR SPECIES: in external appearance this vole is difficult to distinguish from some *Microtus* species especially immature animals. *P. intermedius* has softer, finer fur; the dorsal surfaces of its hind feet are white or silvery rather than black; and the tail is thin with a sparse covering of hairs. The enamel patterns on the lower molars are diagnostic—no *Microtus* species has lower molars with deeper inner re-entrant angles.

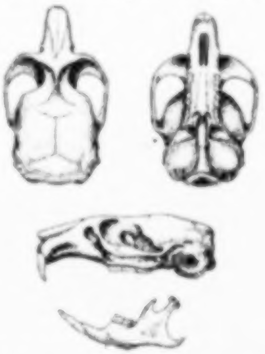


RANGE: most of the mainland of the province but absent from coastal islands.

Synaptomys borealis
(Northern Bog Lemming)



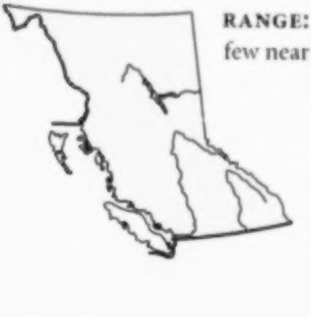
DESCRIPTION: a small vole with a short tail (< 20% of the total length) that is equal to or slightly longer than the hind foot length. The fur is long and coarse. The dorsal pelage is grizzled brown or greyish-brown and the undersides are grey. The ventral side of the tail is sparsely covered with greyish or whitish hairs. The skull has a short rostrum with grooved upper incisors. The re-entrant angles on the upper molars are deeper on the outer side and extend to the inner border of the tooth in the first and second molars (Fig. 96). The lower molars lack closed triangles on the outer sides (Fig. 102).



External measurements: TL= 123 (102–142) n=91, TV= 22 (17–30) n=90, HF= 19 (14–22) n=89, E= 12 (6–15) n=20, WT= 26.4 g (21.7–48.0) n=13.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

SIMILAR SPECIES: the short tail and distinctive enamel patterns on its upper and lower molars discriminate this species from any other British Columbia vole.



RANGE: most of the mainland of the province and a few near shore coastal islands.

SUBFAMILY MURINAE: OLD WORLD RATS AND MICE

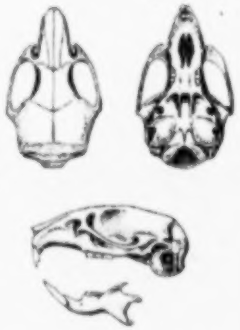
There are three species in British Columbia; all are alien species introduced from Europe or Asia. They have naked tails with visible annulations (Fig. 44). Their skulls have rooted molars, and the cusps of the first two upper molars are arranged in three longitudinal rows (Fig. 98).

Mus musculus (House Mouse)

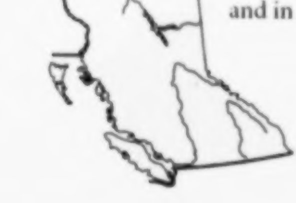
DESCRIPTION: a small 'mouse-like' rodent with a long, naked scaly tail and small ears. The dorsal fur is dull grey-brown, and the ventral fur is grey. The small and delicate skull has upper incisors that are notched in side view (Fig. 124).

External measurements: TL= 163 (142–197) n=41, TV= 79 (64–90) n=48, HF= 18 (15–23) n=45, E= 13 (11–18) n=15, WT=21.4 g (17.0–26.0) n=19.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.



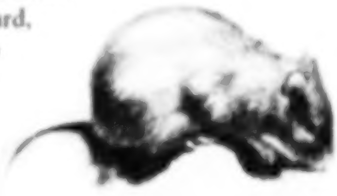
SIMILAR SPECIES: could be confused with the Deer Mouse (*Peromyscus maniculatus*) and Western Harvest Mouse (*Reithrodontomys megalotis*). *P. maniculatus* has a brown dorsal pelage with white ventral fur, the tail is haired (Fig. 45), and its skull has the cusps of the first two upper molars arranged in two longitudinal rows (Fig. 123). *R. megalotis* is smaller (adult weight < 15 grams), the tail is furred, the upper incisors are distinctly grooved (Fig. 127), and the cusps of the first two upper molars are arranged in two longitudinal rows .



RANGE: found in human dwellings; feral populations occur on the southern coast including the Gulf Islands and in the southern interior of British Columbia.

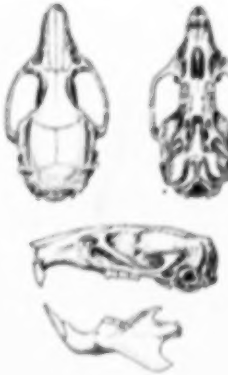
Rattus norvegicus (Norway Rat)

DESCRIPTION: a stout rat with a thick naked tail that is shorter (70–90%) than the head and body length, small ears that do not cover the eye when pushed forward, a blunt snout, and a thick heavy rump (Fig. 48). Dorsal fur is brown and the undersides are pale grey. The skull has a rectangular braincase with straight temporal ridges (Fig. 125); the upper incisors are not notched in side view.

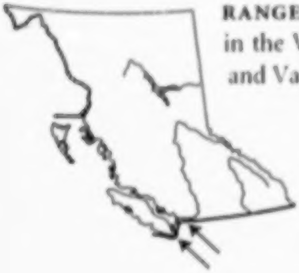


External measurements: TL= 385 (334–436) n=14, TV= 175 (143–202) n=14, HF= 42 (34–44) n=14, E= 20 (18–23) n=5, WT=354.4 g (256.5–434.5) n=5.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

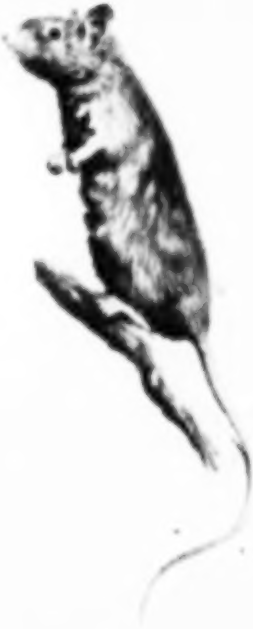


SIMILAR SPECIES: immature animals especially can be confused with the Black Rat (*Rattus rattus*). Diagnostic traits of *R. rattus* are: a slender body with a light rump, tail longer than head and body length, pointed snout, a large ear that covers the eye when pushed forward (Fig. 47), and a skull with a rounded braincase and curved temporal ridges (Fig. 126).



RANGE: found in urban areas; feral populations occur in the Vancouver area, the Queen Charlotte Islands and Vancouver Island.

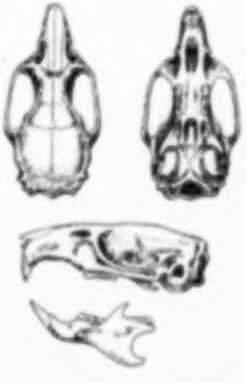
Rattus rattus (Black Rat)



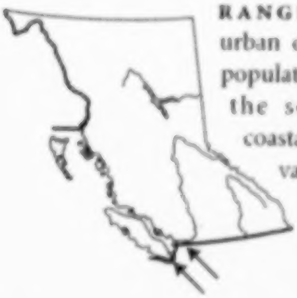
DESCRIPTION: a slender rat with a gracile naked tail that is longer (100-160%) than the head and body length, large ears that cover the eye when pushed forward, a pointed snout, and light slender rump (Fig. 47). Three distinct colour morphs are found in British Columbia: 1) *alexandrinus* morph—grey-brown dorsal pelage with slate-grey belly; 2) *rattus* morph—black dorsal pelage with a slate-grey belly; and 3) *frugivorous* morph—grey-brown dorsal pelage with a white to yellow belly. The three colour morphs can be found at the same locality. The skull has a rounded braincase with curved temporal ridges (Fig. 126); the upper incisors are not notched in side view.

External measurements: TL= 393 (330-455) n=60, TV= 216 (172-255) n=59, HF= 37 (32-42) n=60, E= 23 (21-25) n=14, WT=185.6 g (119.0-267.8) n=23.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.



SIMILAR SPECIES: immature animals especially can be confused with *R. norvegicus*; see that account for distinguishing traits.

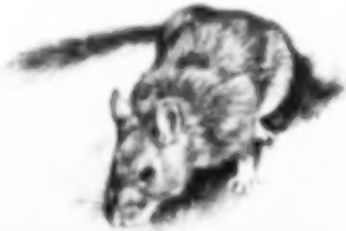


RANGE: found in urban dwellings; feral populations occur on the southwestern coastal mainland and various coastal islands including the Queen Charlotte Islands and Vancouver Island.

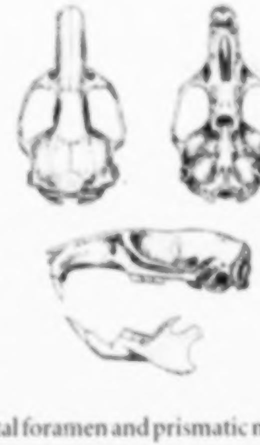
Subfamily Sigmondontinae: New World Rats and Mice

The group demonstrates a diversity of body forms but all British Columbian species have long furred tails, a gracile body (Fig. 42), and conspicuous ears and eyes. The molars are rooted with two rows of cusps (except for the Bushy-tailed Woodrat, *Neotoma cinerea*).

Neotoma cinerea
(Bushy-tailed Woodrat)



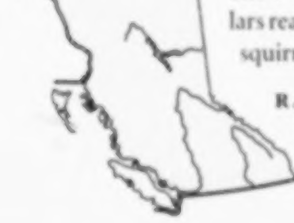
DESCRIPTION: superficially this species resembles a squirrel, with a long bushy tail and conspicuous vibrissae. The dorsal pelage is grey to brown; the ventral pelage and dorsal surface of the feet are white. Males have a ventral gland that deposits a brown stain on the belly fur. The soles of the feet are furred. The skull is large (skull length >40.0 mm); the crowns of molars superficially resemble those of a vole with triangles or prisms of enamel (Fig. 97).



External measurements: TL= 383 (318–468) n=223, TV= 166 (128–205) n=217, HF= 45 (37–57) n=222, E= 30 (23–40) n=43, WT= 374.7 g (315.0–425.0) n=7 males; 326.9 g (292.0–394.6) n=13 females.

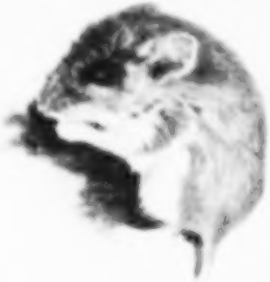
Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3

SIMILAR SPECIES: in external appearance this species could be confused with a squirrel, but the pelage colour, long vibrissae that extend to the shoulders, and five digits on the front feet distinguish *N. cinerea* from any of our squirrel species. The V-shaped infraorbital foramen and prismatic molars readily distinguish the skull of *N. cinerea* from any squirrel (Sciuridae) skull.

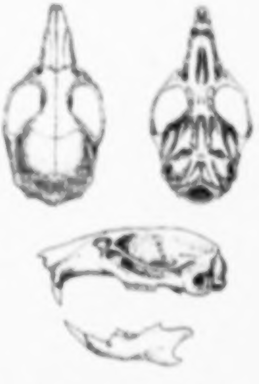


RANGE: the entire mainland of British Columbia but absent from coastal islands.

Peromyscus keeni (Keen's Mouse)



DESCRIPTION: a 'mouse-like' rodent with a long furred tail and conspicuous vibrissae. This species demonstrates considerable size and fur colour variation, particularly among island populations. Typically, the dorsal pelage is brown to dark grey. Some island populations, however, are very dark and have a dorsal band that is nearly black. The undersides are generally white to grey, but one insular subspecies associated with the Hunter Island group on the central coast of British Columbia (i.e., *P. k. rubriventer*) has distinctive reddish-brown markings on its chest and belly. The dorsal surface of the hind feet vary from white or silver to dark brown. The skull is characterized by molars with cusps and incisors that lack grooves.

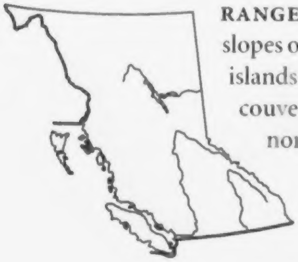


External measurements: TL= 198 (140–263) n=773, TV= 102 (70–126) n=772, HF= 24 (19–32) n=773, E= 18 (12–26) n=327, WT= 26.0 (15.0–52.4) n=774.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3.

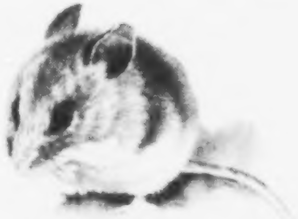
SIMILAR SPECIES: the only similar species is the Deer Mouse (*Peromyscus maniculatus*). Their distributions overlap on the southern coastal mainland, the eastern slopes of the Cascade and Coast mountains, Vancouver Island, and a few associated islands. The two species differ in chromosomes and other genetic traits but identification from external morphology in these regions is problematic. Adult *P. maniculatus* generally have a shorter tail (< 98 mm) (Gunn and Greenbaum 1986; Allard and Greenbaum 1988) but this measurement overlaps to some extent among some populations of *P. keeni* and *P. maniculatus*. Similarly, although *P. keeni* averages larger than *P. maniculatus* in most cranial measurements, the two species can not be discriminated by any single skull measurement. Based on specimens identified from western Washington, and islands and coastal areas of southwestern

British Columbia that were identified from genetic traits, Allard and Greenbaum (1988) developed a discriminant function using tail length and length of the mandibular diastema that reliably discriminated the two species. However, this can not be used on live animals as it requires a skull, and its reliability needs to be assessed in other regions (e.g., the east slopes of the coastal mountain ranges) where the two species co-occur. Immature *Peromyscus* can only be identified to species from genetic traits.

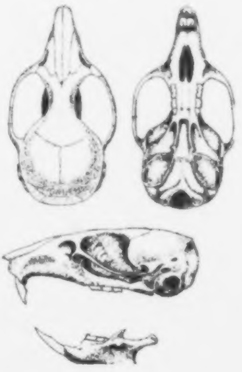


RANGE: the coastal mainland east to the eastern slopes of the coastal mountain ranges, the north coast islands including the Queen Charlotte Islands, Vancouver Island and some associated islands off the north and west coast of Vancouver Island.

Peromyscus maniculatus (Deer Mouse)



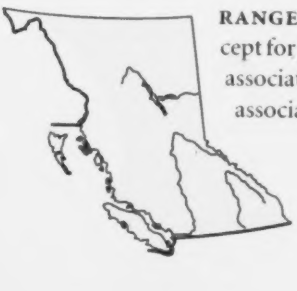
DESCRIPTION: a 'mouse-like' rodent with a long furred tail, and conspicuous vibrissae. The dorsal fur is brown with a white belly and white on the dorsal surface of the hind feet. Some island populations of the coastal subspecies *P. m. austerus* tend to be very dark, whereas populations of the *P. m. artemisiae* in the dry interior are pale. Nevertheless, this species is less variable in fur colour than Keen's Mouse (*Peromyscus keeni*). The skull has molars with cusps and the incisors lack grooves.



External measurements: TL= 170 (125–209) n=1519, TV= 80 (50–104) n=1521, HF= 21 (15–28) n=1521, E= 17 (10–22) n=662, WT= 21.7 (15.0–41.8) n=1521.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3

SIMILAR SPECIES: on the southern coast and east slopes of the coastal mountain ranges distinguishing this species from *P. keeni* is problematic (see previous species account). In the Okanagan region, *P. maniculatus* could be confused with the Western Harvest Mouse (*Reithrodontomys megalotis*). *R. megalotis* is smaller; adults have a total length less than 150 mm and weigh less than 15 g. Any *P. maniculatus* that are similar in size to *R. megalotis* are obvious juvenile animals that can be discriminated by their dull grey pelage. The skull of *R. megalotis* has distinct grooves on the anterior face of the upper incisors and is smaller (skull length <23.0 mm, maxillary toothrow length <3.8 mm).



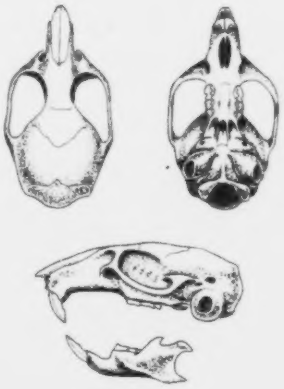
RANGE: the entire mainland of British Columbia (except for the central and northern coastal mainland and associated islands), Vancouver Island, and its various associated islands such as the Gulf Islands.

Reithrodontomys megalotis (Western Harvest Mouse)

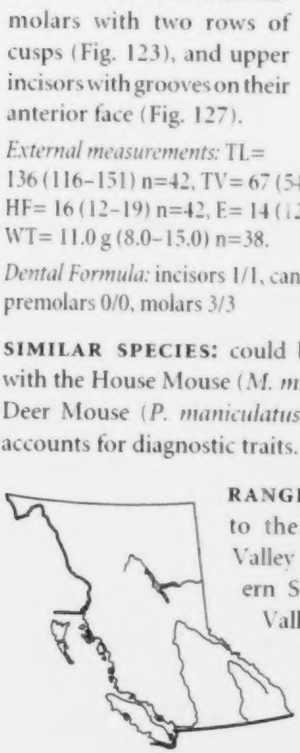
DESCRIPTION: the smallest ‘mouse’ in British Columbia, it has a reddish-brown dorsal fur and white underparts. The tail is slender and sparsely haired. The small delicate skull has molars with two rows of cusps (Fig. 123), and upper incisors with grooves on their anterior face (Fig. 127).

External measurements: TL= 136 (116–151) n=42, TV= 67 (54–86) n=42, HF= 16 (12–19) n=42, E= 14 (12–17) n=14, WT= 11.0 g (8.0–15.0) n=38.

Dental Formula: incisors 1/1, canines 0/0, premolars 0/0, molars 3/3



SIMILAR SPECIES: could be confused with the House Mouse (*M. musculus*) and Deer Mouse (*P. maniculatus*). See those accounts for diagnostic traits.

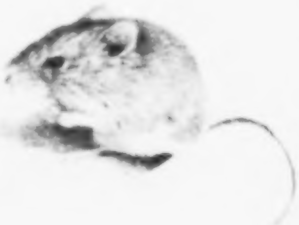


RANGE: confined to the Okanagan Valley and southern Similkameen Valley.

FAMILY DIPODIDAE: JUMPING MICE AND JERBOAS

Small mouse-like rodents that have elongated hind limbs and hind feet, and long, nearly naked tails (Fig. 46). The skull has a large oval infraorbital opening (Fig. 89) and rooted cheek teeth that are high crowned with distinct transverse ridges.

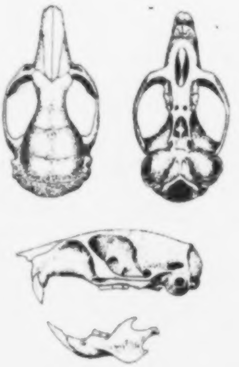
Zapus hudsonius
(Meadow Jumping Mouse)



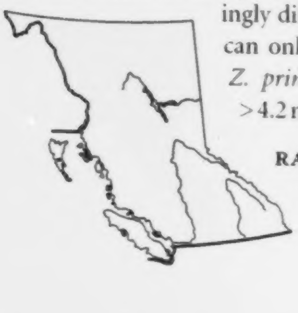
DESCRIPTION: our smallest jumping mouse, it has bright yellow to buff sides, a grey dorsal band, and whitish undersides typically with buffy patches on the belly, chest, and throat. The skull is small; the upper premolar is simple lacking a crescent fold at the base of the main cusp (Fig. 94).

External measurements: TL= 213 (190–237) n=113, TV= 130 (114–149) n=111, HF= 31 (28–34) n=110, E= 13 (10–16) n=32, WT= 16.7 g (10.0–25.0) n=34.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/0, molars 3/3.

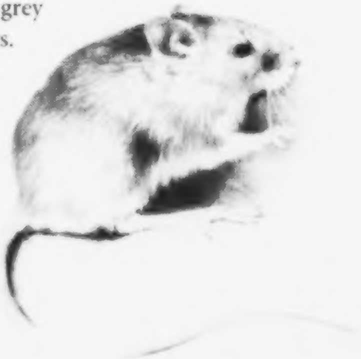


SIMILAR SPECIES: throughout most of its range in the province, this species co-occurs with the Western Jumping Mouse (*Zapus princeps*). In most areas where the two species co-occur, *Z. princeps* is slightly larger and has duller sides that range from yellow to grey and white undersides that lack a buffy wash or buffy patches. Nonetheless, because both species show considerable variation in pelage colour, distinguishing the two taxa from external traits is exceedingly difficult in some regions. Positive identification can only be made from the skull, with the skull of *Z. princeps* being larger (incisive foramen length > 4.2 mm and a maxillary toothrow length> 3.7 mm).



RANGE: across northern and southern British Columbia as far south as the Okanagan Valley in the central interior.

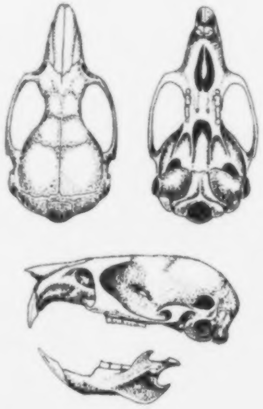
Zapus princeps (Western Jumping Mouse)



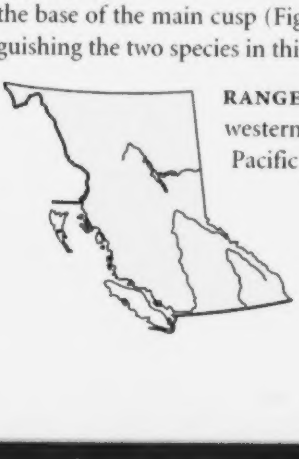
DESCRIPTION: the dorsal pelage has a grey dorsal band and dull yellow to grey sides. The undersides usually lack a buffy wash or buffy patches on the throat (except some populations of the subspecies *kootenayensis*), chest, or abdomen. The upper premolar is simple lacking a crescent fold at the base of the main cusp (Fig. 94).

External measurements: TL= 235 (209–265) n=218, TV= 142 (122–162) n=218, HF= 32 (27–34) n=220, E= 12 (10–16) n=81, WT= 24.6 g (17.7–37.5) n=68.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/0, molars 3/3



SIMILAR SPECIES: to distinguish from Meadow Jumping Mouse *Z. hudsonius* see that species account. In southwestern British Columbia, this species coexists with the Pacific Jumping Mouse (*Zapus trinotatus*) in a narrow zone along the crest of the Cascade Range and the southern Coast Mountains. Although *Z. trinotatus* tends to be more brightly coloured with buffy wash and buffy patches on the ventral pelage, and its upper premolar has a crescent fold at the base of the main cusp (Fig. 93), these traits tend to be variable. Distinguishing the two species in this contact zone is problematic.



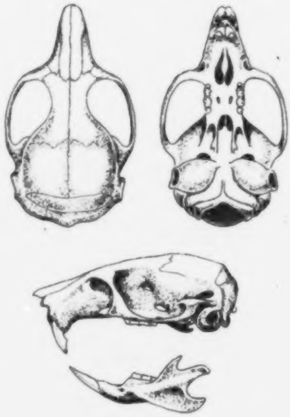
RANGE: the entire mainland except for extreme southwestern British Columbia, where it is replaced by the Pacific Jumping Mouse (*Z. trinotatus*).

Zapus trinotatus (Pacific Jumping Mouse)

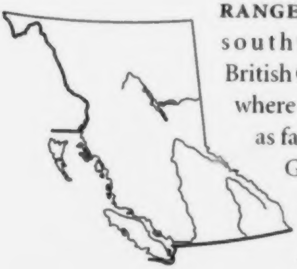
DESCRIPTION: a large brightly coloured jumping mouse. The dorsal pelage has bright yellow to light orange sides that contrast sharply with the dark dorsal band. The undersides are usually white, washed with buff; buffy patches may occur on the throat, chest, and abdomen. The upper premolar is complex with a crescent fold at the base of the main cusp (Fig. 93).

External measurements: TL= 237 (215–258) n=87, TV= 144 (123–162) n=86, HF= 32 (29–31) n=86, E= 14 (12–16) n=10, WT= 24.2 (17.0–36.0) n=20.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/0, molars 3/3



SIMILAR SPECIES: see previous accounts for distinguishing from Z. *princeps.*



RANGE: extreme southwestern British Columbia where it ranges as far north as Garibaldi Provincial Park and east to the Allison Pass area in Manning Provincial Park.

FAMILY ERETHIZONTIDAE: NEW WORLD PORCUPINES

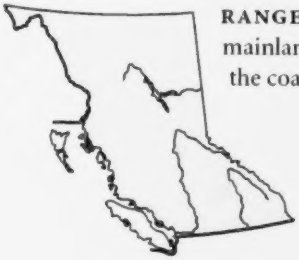
Erethizon dorsatum (Porcupine)

DESCRIPTION: a large rodent with long stiff spines, particularly on the tail and rump. The skull is massive with a round infraorbital opening that exceeds the foramen magnum in size.

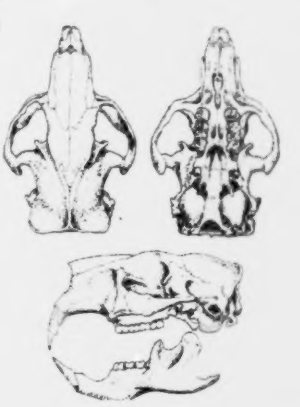
External measurements: TL= 795 (657–932) n=34, TV= 231 (170–330) n=86, HF= 107 (84–124) n=86, E= 24 (15–34) n= 6, WT= 9.1 kg (4.3–12.3) n=18 males; 5.6 kg (3.3–8.4) n=9 females.

Dental Formula: incisors 1/1, canines 0/0, premolars 1/1, molars 3/3

SIMILAR SPECIES: none.



RANGE: most of the mainland; absent from the coastal islands.



Glossary of Technical Terms

Annulations: scaly rings on the tail.

Auditory Bulla: bony capsule that covers the middle and inner ear.

Alveolus: socket in the upper or lower jaw in which the root of a tooth is set.

Angular Process: bony projection on the mandible or jaw bone that lies below the point where the jaw articulates with the skull (Figs. 2, 3)

Baculum: male genital bone (os penis bone); an important identification trait in chipmunks (Fig. 145).

Basilar Length: a measurement of skull length taken from the mid-ventral border of the foramen magnum to the anterior border of the alveoli of the median incisor (Fig. 81).

Basioccipital: ventral portion of the bone surrounding the foramen magnum.

Baubellum: female genital bone (os clitoris bone); an important identification trait in chipmunks (Figs. 146, 147, 148).

Body Length: total length minus tail vertebrae length, i.e., length excluding the tail (Fig. 7).

Calcar: a cartilaginous spur in some bats that projects from the ankle along the edge of the tail membrane. The presence or absence of a calcar is an important identification trait.

Canine: tooth posterior to the incisors and anterior to the premolars (Fig. 70); a single canine occurs on each side of the upper and lower jaws in mammals. Canines are usually long and dagger-like but are flattened in the moles.

Cheek Teeth: general term referring to the premolars and molars.

Cingulum: an enamel shelf that lies below the cusp or peak of a tooth; in shrews the cingulum on the upper unicuspid teeth is on the inside or tongue side of the unicuspid (Figs. 65, 67).

Cusp: a high peak or rounded area on the crown of a tooth.

Dentine: hard ivory-like substance beneath the enamel of teeth. In some rodents such as voles the dentine is exposed on the crown surface of the molar teeth (Fig. 96, 97).

Dorsal: the back or upper surface.

Ear Length: length of the ear measured from the ear notch (Fig. 7).

Enamel: the hard outer layer of the crown of the tooth (Fig. 96, 97). Usually white but may be yellow or brown in some rodents and red in some teeth of shrews.

Fenestrate: with openings or perforations (Fig. 4).

Foramen Magnum: large opening at the rear of the skull through which the spinal cord passes.

Forearm Length: length of the bat forearm measured from wrist to elbow (Fig. 7).

Hind Foot Length: length of the hind foot measured from the edge of the heel to the end of the longest claw (Fig. 7).

Incisors: anterior-most teeth in the mammalian skull and jaw; teeth preceding the canines (Figs. 51, 70, 87).

Incisive Foramen: a pair of openings that pierce the palate behind the incisor teeth (Fig. 87).

Incisive Foramen Length: a measure of the length of the incisive foramen (Fig. 95).

Infraorbital Opening: an opening that passes through the side of the rostrum to the front face of the orbit of the skull (Figs. 89-92).

Interorbital Region: the dorsal area of the skull that lies between the orbits.

Interparietal Bone: an unpaired bone at the back of the braincase (Fig. 84).

Mandible: lower jaw.

Marsupium: abdominal pouch of marsupials where young are carried and nursed.

Maxilla: bone in the upper jaw that supports the canine, premolar, and molar teeth.

Maxillary Toothrow Length: length of the upper toothrow (usually excluding incisors) taken at the alveoli (Figs. 71, 81, 87).

Medial: lying in or near the plane that divides the skull into two mirror image halves.

Melanism: fur colour mutation where fur colour is black.

Molars: last teeth in the jaws, posterior to premolars (Figs. 51, 70, 87). Number varies among mammals but the maximum number is four on each side of the upper and lower jaws (e.g., opossums).

Opposable: positioned opposite; in the North American Opossum the large toe is positioned opposite to the other toes (Fig. 1).

Palatal Length: length of the palate measured from the posterior border of the palate to the anterior border of the alveolus of the median incisor (Fig. 52).

Pelage: fur; the hairs of a mammal.

Prehensile: adapted for grasping as in the tail of the North American Opossum.

Premolars: teeth following the canine and preceding the molars (Figs. 51, 70). Number of premolars varies among mammals but the maximum number (e.g., moles) is four on each side of the upper and lower jaws.

Ramus: vertical posterior part of the jaw bone.

Re-entrant angle: inward pointing angle along the margin of vole molars (Fig. 88).

Rostrum: the nasal area or snout of a skull.

Salient angle: outward pointing angle along the margin of vole molars (Fig. 88).

Skull Length: length of the skull measured from posterior border of occipital foramen to the anterior border of rostrum (Figs. 52, 71, 87)

Supraorbital Processes: bony projection above the orbit of the skull; well developed in lagomorphs (Fig. 84).

Tail Vertebrae Length: length of the tail measured from the base to last vertebra (Fig. 7).

Temporal Ridges: a prominent ridge traversing the side or top of the braincase (Fig. 125).

Tine: in shrews refers to the small, pointed accessory cusps found on the middle of the anterior face of the upper incisor (Fig. 16, 17). The presence or absence of medial tines and their size and position relative to the pigmented area on the face of the incisor is an important identification trait.

Total Length: length measured from tip of the nose to last tail vertebra (Fig. 7).

Tragus: a thin cartilaginous structure attached to the base of the ear in bats.

Tragus Length: length of tragus measured from its tip to where it is attached at the notch of the ear.

Unicuspid: in shrews refers to a series of five teeth in the upper jaw and one or two teeth in the lower jaw that follow the incisor and are characterized by having a single cusp (Fig. 51). The relative size of the upper unicuspids is an important identification trait.

Ventral: the under or lower surface.

Vertebra (pl. vertebrae): one of the small bones making up the backbone

Vibrissae: long tactile hairs on the face; whiskers.

Zygomatic Arch: an arch of bone that extends across the orbit of the eye in the skull (Fig. 53). Not found in the shrew skull but present in opossum, mole, bat, lagomorph, and rodent skulls.

Zygomatic Plate: a thin plate extending from the zygomatic arch to the rostrum (Figs. 99, 100).

Zygomatic Process of Maxilla: projection of the maxilla bone that forms the anterior part of the zygomatic arch.

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